American Machinist

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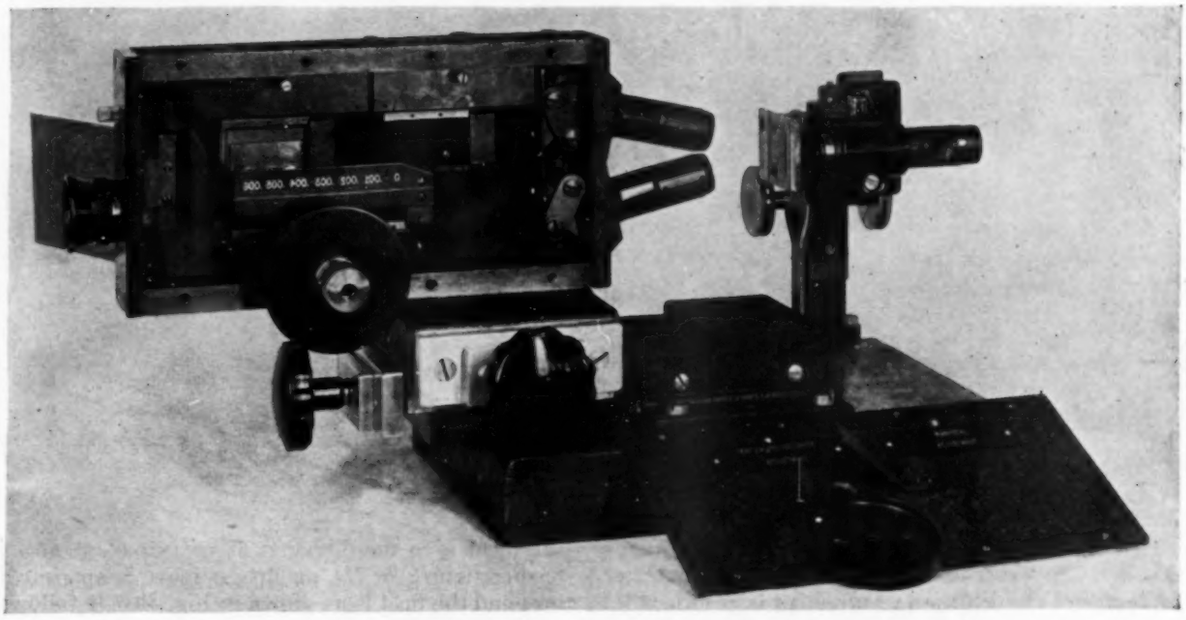

Fig. 1—An adaptation of the optical coincidence principle by Bausch and Lomb. Locating the image of a slit, as performed here, would not be possible with a contact gage

OPTICAL COINCIDENCE GAGE

Dr. I. C. Gardner
*Bureau of Standards**

Mechanical measurement is subject to errors of distortion, particularly where point contact is employed. The optical principle here described avoids this source of inaccuracy by gaging parts without touching them.

THE MEASUREMENT of a finished part, by means of a screw micrometer, snap gage, or gage with dial indicator, necessitates a mechanical contact at the two extremities of the dimension to be gaged. This mechanical contact at the two opposing faces may be disadvantageous because of the uncertainty which results from the possibility of deformation of the gage or of the part to be gaged. This difficulty is one which becomes particularly important when gaging fragile materials or when it becomes desirable to use a point contact which necessarily gives rise to relatively large local pressures. To escape these disadvantages of the usual contact gage, the coincidence gage has been developed. In this type of gage, one or both of the mechanical contacts is replaced by an "optical contact." The position of the face, which terminates the dimension to be gaged, is determined by an optical method entirely without mechanical contact and consequently entirely without error resulting from deformation. Although the instrument is sufficiently simple in its operation to permit its use in routine measurements in industrial establishments, the probable error

*Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

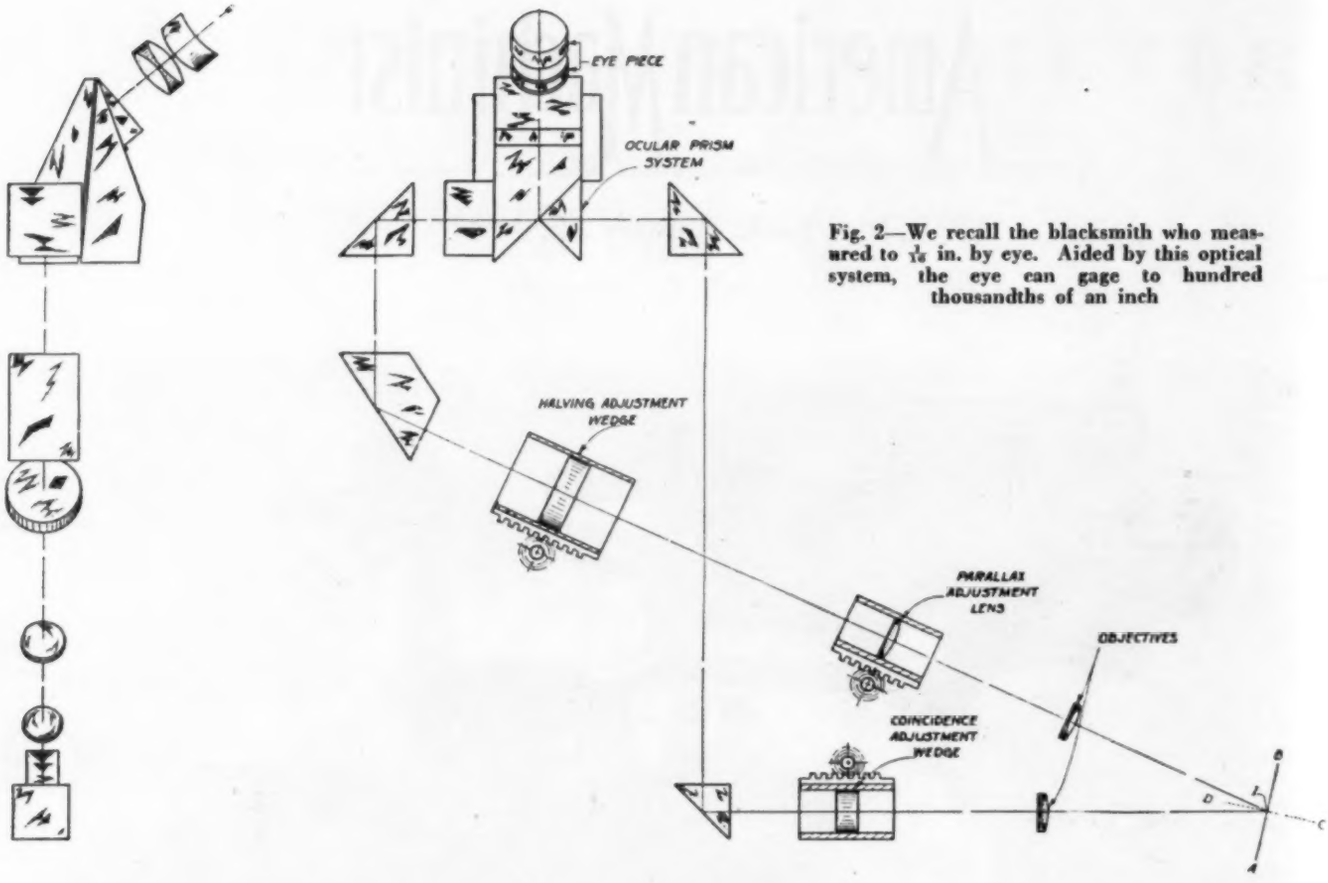

Fig. 2—We recall the blacksmith who measured to $\frac{1}{16}$ in. by eye. Aided by this optical system, the eye can gage to hundred thousandths of an inch

of a single setting need not be greater than plus or minus 0.00004 in. The exact value depends upon the character of the surface to which the measurement is made.

The optical system of the gage is shown in Fig. 2. It consists of two microscope systems, with two objectives and a single eyepiece. The "parallax adjustment lens," "coincidence adjustment wedge" and "halving adjustment wedge" are auxiliary parts of the system which are used in adjusting the instrument for use. The other prisms deviate the rays to bring the two images into the common eyepiece. For a more detailed description of the construction, refer to "An Optical Coincidence Gage," by I. C. Gardner and F. A. Case, to appear in the February issue of the Bureau of Standards Journal of Research. Fig. 3 shows the field of view which is seen when looking into the instrument. It is divided by a diameter into two halves, corresponding respectively to the two objectives. The surface, to which the measurement is to be made must have toolmarks, scratches or other landmarks which are turned so that their greatest dimensions lie approximately at right angles to the dividing line. This is not a serious limitation to the use of the instrument, as few surfaces are free from such local variations when examined under suitable magnification. By a slight modification of the instrument, measurements may be made to a polished surface of optical quality. The image in one-half of the field is the mirror image of that in the other half. When the surface bearing the landmarks is in the plane normal to the drawing and containing the line *AIB* (Fig. 2) the two images will match at the dividing line and the appearance will be as shown in Fig. 3a.

If the surface is displaced in any direction such as *IA* or *IB*, lying within this plane, the two images move together and continue to match. If, however, the displacement is in the direction of measurement, that is, in the direction *IC* or *ID*, the images move in opposite directions and the field is as shown in Fig. 3b. It follows that the optical system acts as a sensitive indicator to show when a surface lies in the plane *AIB*. For measuring distances greater than a few hundredths of an inch, the optical system serves as an indicator only. The instrument must be mounted on a slide provided with a micrometer screw or other device for measuring that displacement of the instrument necessary to bring, in succession, into the plane *AIB* the two surfaces which limit the dimension to be gaged. For measuring very small lengths, the instrument may be provided with a measuring prism, which when moved, changes by optical means the point *I* at which the axes of the two microscope systems intersect. This measuring prism can be provided with a scale by which the change in the position of *I* may be read directly. Such a scale is shown on the instrument illustrated in Fig. 1. Those familiar with the self-contained base military range finder will recognize

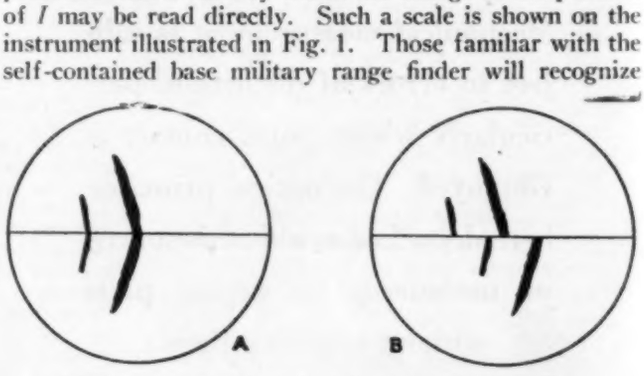

Fig. 3—(A) Toolmarks on the surface to be measured determine its location. (B) When the toolmarks do not coincide, further adjustment must be made

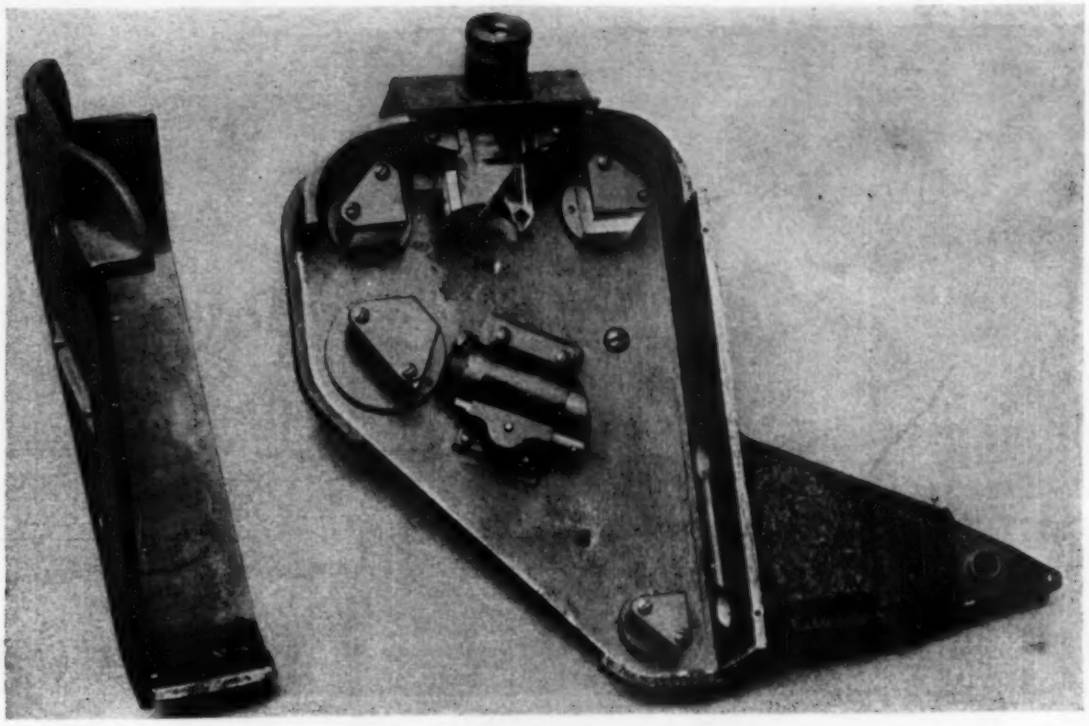

Fig. 4—This instrument, built at the Bureau of Standards, accurately gages parts without touching them

at once the similarity between it and an optical coincidence gage.

In the instrument which has been built at the Bureau of Standards, the magnification of each microscope system is approximately 85 diameters, the angle between the two axes is 25 deg. and, as has been already mentioned, the probable error of a single setting is approximately plus or minus 0.00004 in. The complete instrument is shown in Fig. 4. The peculiar external shape was chosen because the instrument was planned for making internal measurements for which it was advantageous to have the nosepiece projecting to the right and carrying the objectives. This shape is not a necessary characteristic, and for most purposes, the instrument would probably be given a more symmetrical form.

A problem encountered by the Bausch & Lomb Optical Company was solved at the Bureau's suggestion by the adoption of the same optical system. Fig. 1 is an illustration of the instrument which this company has built. In this application, the gage is used to give a fixed location to the optical image of an illuminated slit which forms a part of the sound reproducing device of a talking motion picture projection machine. This obviously is a case in which an optical method of measurement must be employed, as it is impossible to make mechanical contact with an optical image. The probable error of a single setting of this particular instrument is approximately plus or minus 0.00002 in.

Many other applications may be mentioned in which the absence of a mechanical contact is an advantage. For measuring the thickness of paint films, it is customary to use a dial indicator provided with a metal pad of considerable area to decrease the error which arises through compression of the substance being measured. The use of a pad, however, gives the maximum thickness of film and does not permit the thickness to be measured at a point, a measurement which is readily made with the optical coincidence gage. The diameter of a rotating part in a precision grinding machine or lathe can be readily measured without stopping the machine and without abrasion of the gage jaws or of the rotating part to be gaged. A piece can be gaged while hot without local cooling of the part or local heating of the gage at the point of contact. Furthermore, if the gage is provided with a periscope system for entering into hollow castings, the optical gage readily accomplishes interior measurements which would be impossible, or at least more difficult, with a mechanical measuring device.

■

Managerial Tact

J. Homewood

Instructor Chaffey Junior College

RECENTLY I was within hearing of a manager who was showing a visitor through his shop. He was explaining to the visitor the simplicity of the article being manufactured and enlarging upon the profits he was getting out of it. All this was within the hearing of the employees doing the bulk of the necessary machining and assembling. This, to me, appeared like a breach of industrial tact. Naturally the employee is going to "think things over" and form some peculiar ideas regarding wages and profits, with the result that either he becomes dissatisfied, or deliberately slows his work.

It is only natural that the employee is going to feel, under such circumstances, that he is getting the "small end" regardless of the fact that the basic idea behind the merits of the article being manufactured belongs to the employer. However, why cause dissatisfaction among employees when it can be avoided?

How Reo Machines Transmission Cases

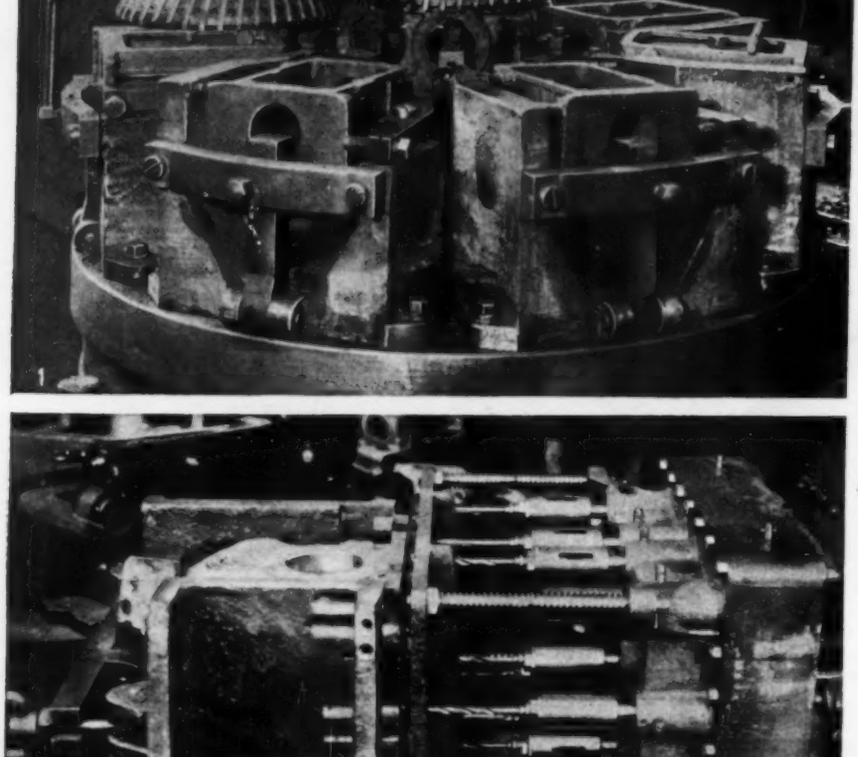

Fig. 1—Top faces of transmission cases are roughed and finished on this rotary milling machine

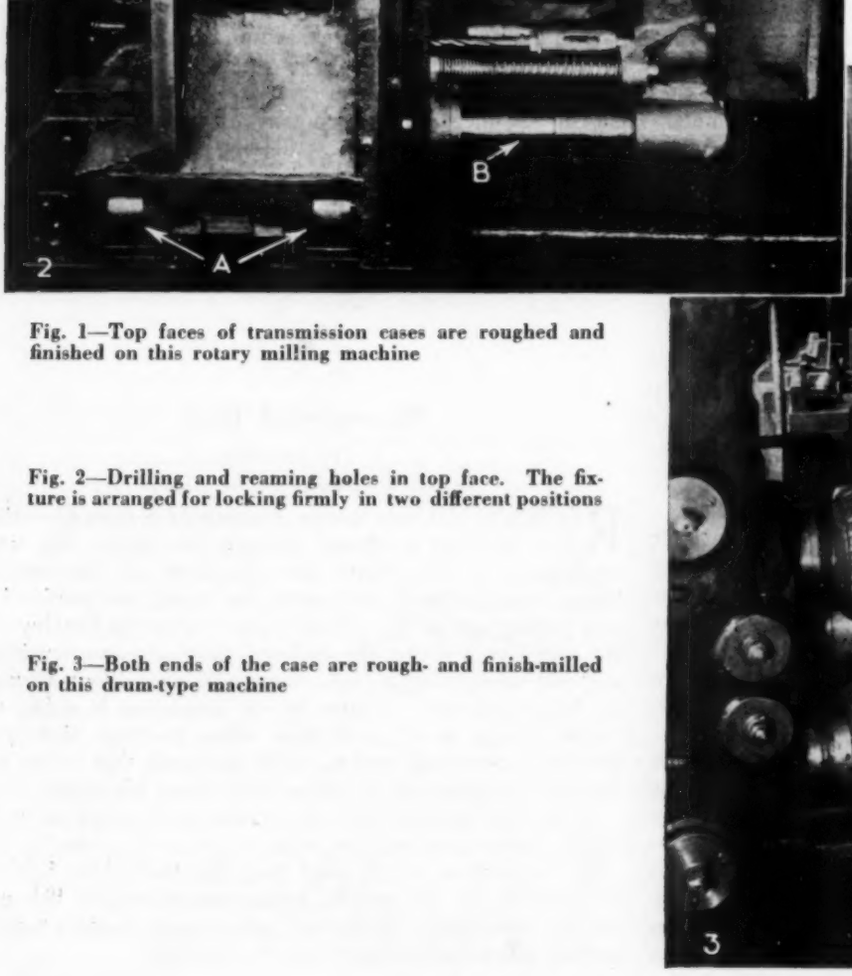

Fig. 2—Drilling and reaming holes in top face. The fixture is arranged for locking firmly in two different positions

Fig. 3—Both ends of the case are rough- and finish-milled on this drum-type machine

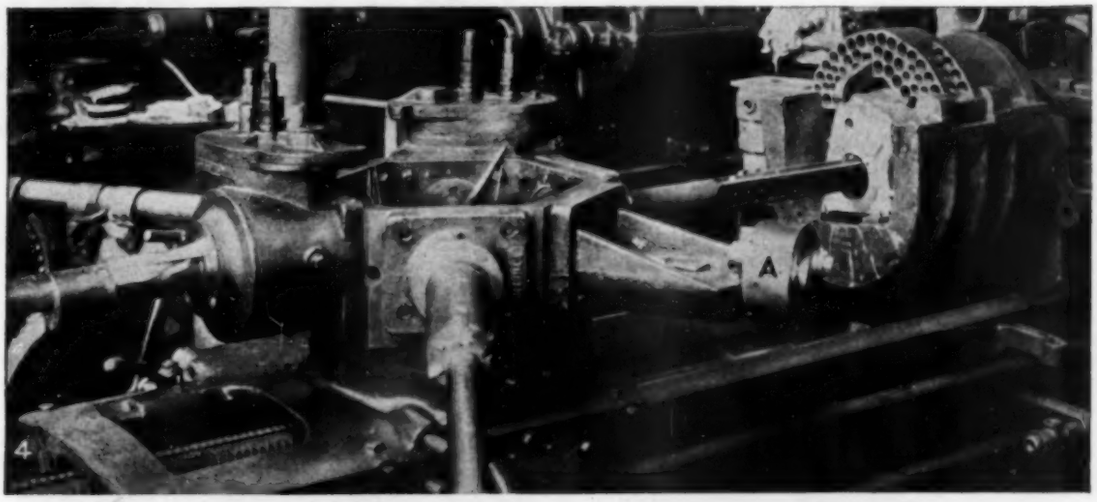

Fig. 4—Boring the case in a turret lathe with special tools and fixtures

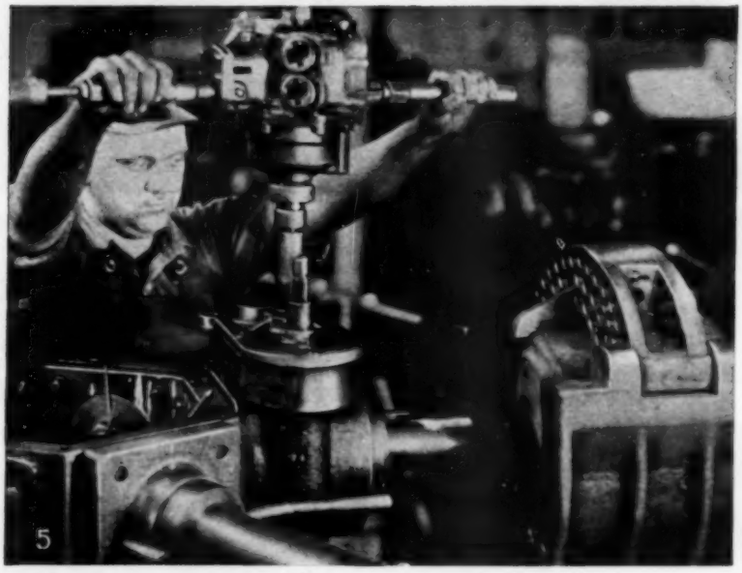

Fig. 5—One of the special air-driven tools in action on the turret lathe

MILLING, drilling, tapping, and boring constitute the operations on a transmission case. But the fixtures needed for holding them while in process, and the machines and tools used, vary according to the design of the case and to the ideas of production departments. Accompanying illustrations show how the various operations are handled in the Reo plant.

Seven fixtures mounted on the table of a rotary milling machine carry the transmission cases under two large inserted-tooth cutters on vertical spindles, for facing the top flange of the case, as seen in Fig. 1. The first cutter roughs and the second takes the finishing cut, after which the case is unloaded.

Next comes the drilling of the holes in the face of the case that has just been milled, and the reaming of the dowel-pin holes. As shown in Fig. 2, this operation is done on a two-station horizontal machine and in a fixture that can be moved across the bed of the machine on the wide faced rolls *A* at the bottom. By splitting the drilling into two operations in this way, holes on relatively close centers can be drilled with spindles that are far enough apart to have substantial and long-lived bearings. The fixture is located in its two positions by guide pins *B* shown at the bottom of the drilling head. Springs hold the bushing plate firmly against the work.

Using the holes thus drilled to locate the work, the cases next are clamped in suitable fixtures in the drum-type milling machine shown in Fig. 3. These fixtures have a floating clamp which equalizes the pressure on each end of the case and holds it by a single bolt. Two sets of milling cutters rough and finish the ends of the cases fed continuously between them.

A somewhat similar fixture is used in holding the cases for boring in the turret lathe illustrated in Fig. 4. The equalizing bar, however, is held in a clamp that has been honeycombed by drilling, to reduce weight and to make it easy to handle. Six special tools are used in the turret. The boring bar carries inserted teeth on the upper side only. An eccentric tool *A*, operated by a lever, is used for a recessing operation. Two of the other tools are operated by an air motor that is kept conveniently suspended in front of the lathe. It is shown in operation in Fig. 5. This motor drives tools inside the case for back facing and other special operations.

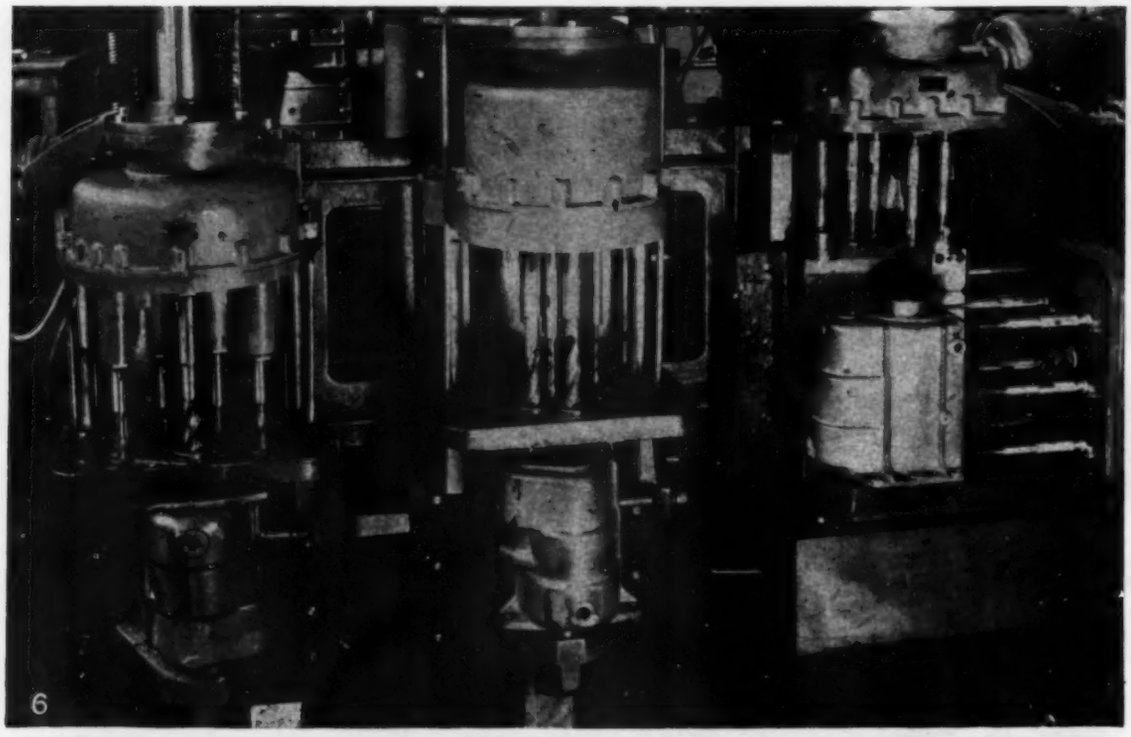

Fig. 6—Drilling and tapping the case on a combination machine

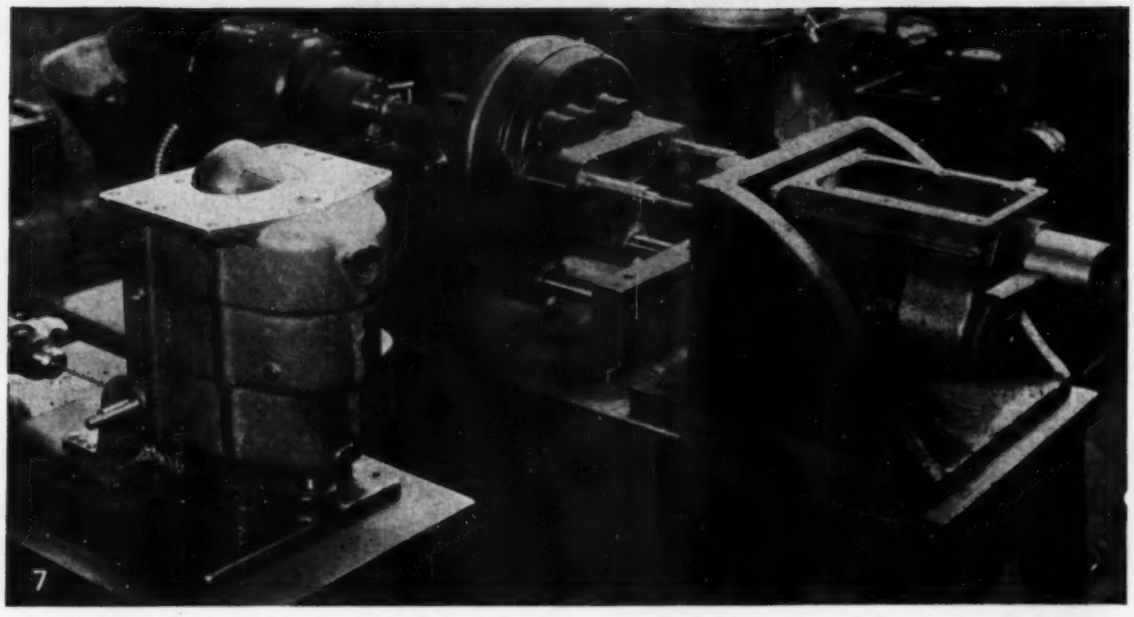

Fig. 7—Two small drilling heads are used for these special operations

End drilling of the cases and tapping of holes previously drilled in the top face are done on the three-spindle machine illustrated in Fig. 6. The two ends are drilled separately, quick-acting fixtures holding the case successively in the first two stations. The case then is passed, without reversing, to the third station under the third vertical spindle. Attached to the fixture there is also a horizontal head carrying six spindles for tapping the upper face. Although this head is separate, it operates in unison with the other tapping head.

Two other drilling operations that put the finishing touches on the case are pictured in Fig. 7. In the one at the right, the case is held rigidly in alignment by the heavy bar that passes through the main hole. The drill head is guided by two substantial bars below, and the drills are guided by bushings in the fixture. In the other operation a hole for a cross pin, used to secure the side stud for the brake lever and to prevent it from turning, is drilled while the case is located by the large central stud and a small pin at the back.

NEW BOOKS

COMPRESSED AIR PLANT, FIFTH EDITION—*By Robert Peele, Mining Engineer and formerly Professor of Mining, School of Mines, Columbia University. 554 pages, 5⅞x9 in. Indexed. Illustrated. Clothboard covers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $7.50.*

Technical advances in compressed-air practice during the past decade have necessitated complete rewriting of this standard text. Two parts, one covering production, the other transmission and use, of compressed air, comprise the book. One striking characteristic is the author's direct treatment of the problem regarding the mention of company names. Many of his illustrations are of the products of specific companies, are labelled as such, and referred to in the text by trade name and company designation, a decided innovation to the reader used to silk-glove treatment of the company-name problem and consequent vagueness of text. This author lists all known manufacturers of reputable apparatus and introduces another innovation in his liberal use of illustrative and tabular material, making this a ready reference volume for the engineer or production executive engaged in this work. General style is concise, almost "catalogic" but clear and comprehensive, and content seems generally up to date, authentic, and complete. Only in a few instances are unaltered illustrations or text from earlier editions apparent.

ENGLISH-GERMAN-ITALIAN TECHNO-DICTIONARY.—*By Hubert Hermanns. 432 pages, 4¼x6 in. Paper covers. Published by Hubert Hermanns, Berlin-Lichterfelde, Germany. Price $3.75.*

For any engineer who has occasion to employ the German and Italian languages, either for translation of technical papers or for correspondence, this dictionary will be found to be very convenient. It is divided into three parts so that the word in any of the three languages may be looked up directly. Explanations of the words are not included, the direct translation in one word being given in each case.

ANNUAL REPORT OF THE SMITHSONIAN INSTITUTION, 1929.—*608 pages, 6x9 in. Cloth boards. Indexed. 97 illustrations. Published by the U. S. Government Printing Office, Washington, D. C. Price $1.75.*

In addition to the financial report of the institution, and the reports of its various officers and curators, this book contains a large amount of matter contributed by eminent scientists and some historical matter of considerable interest. The subjects covered are: The Physics of the Universe, Sir James Jeans; Counting the Stars, and Some Conclusions, Frederick H. Seares; The Lingering Dryad, Paul R. Heyl; What is Light?, Arthur H. Compton; Artificial Cold, Gordon B. Wilkes; Photosynthesis, E. C. C. Baly; Newly Discovered Chemical Elements, N. M. Bligh; Synthetic Perfumes, H. Stanley Redgrove; X-Raying the Earth, Reginald A. Daly; The Gulf Stream and Its Problems, H. A. Marmer; Extinction and Extermination, I. P. Tolmachoff; The Mystery of Life, F. G. Donnan; The Transition From Live to Dead; The Nature of Filtrable Viruses, A. E. Boycott; Heritable Variations, Their Production by X-Rays and Their Relation to Evolution, H. J. Muller; Social Parasitism in Birds, Herbert Friedmann; How Insects Fly, R. E. Snodgrass; Climate and Migrations, J. C. Curry; Ur of the Chaldees: More Royal Tombs, C. Leonard Woolley; The Population of Ancient America, H. J. Spinden; The Aborigines of the Ancient Island of Hispaniola, Herbert W. Krieger; The Beginning of the Mechanical Era in America, Carl W. Mitman; The Servant in the House: A Brief History of the Sewing Machine, Frederick L. Lewton; Thomas Chrowder Chamberlin (1843-1928), Bailey Willis; Hideyo Noguchi, Simon Flexner.

MECHANICAL REPLACEMENTS, A UNIT OF THE INSTRUCTION MANUALS FOR AUTOMOBILE MECHANICS, MAINTENANCE SERIES—*By J. A. Roenigk. 104 pages, 8x11 in., 127 illustrations. Indexed. Paper covers. Published by the McGraw-Hill Book Company Inc., 370 Seventh Ave., New York, N. Y. Price $1.25.*

A comprehensive treatment of automobile repair operations which involve the repair or replacement of parts, this manual is intended for the student of servicing. It contains text book references to permit closer study of those operations requiring it, and lists problems at the end of each chapter. The attempt is to present a general guide to proper repair and maintenance, rather than to give specific procedures for any particular make. Division is logically by repair operations; illustrations are used liberally; the presentation is fair and straightforward.

STATISTICAL ABSTRACT OF THE UNITED STATES, 1930 (52nd ANNUAL NUMBER)—*Prepared in the Division of Statistical Research, Bureau of Foreign and Domestic Commerce, under the general direction of E. Dana Durand and Ernest A. Tupper, and under immediate charge of Martha Hunter. 876 pages, 5¾x9 in. Cloth board covers. Indexed. Appendixed. 842 tables. For sale by the Superintendent of Documents, Washington, D. C. Price $1.00.*

A digest of data collected by all departments of the National Government, by private agencies, and by States, this volume is a series of tables covering everything from area and population to patents and manufactures. Sections on finances, money and banking, prices, wages and hours of labor, power, foreign commerce, transportation mediums, mining and mineral products, and manufactures, will prove of especial interest to the executive. The low price makes the volume a particularly attractive addition to the current statistics needed by every progressive company.

EXECUTIVE FORUM

No Change

THE MONTHLY meeting of the Metal Manufacturers Association was usually a dull affair. The minutes of the previous meeting were read, a few perfunctory motions were made and carried, and committee chairmen made routine reports. But tonight everyone sat up in his seat, listening attentively to each word. George B. Coakley, President of the Mid-City Iron Works, was speaking.

"We are all agreed that each of us needs to use every means within his power to reduce manufacturing expense. We know that a contributory source of this expense is excessive labor turnover. In this community, things have gotten so bad that no sooner is a man properly trained for his job than he decides that a neighboring plant looks better and makes a change. No one benefits by this move; the repetition of this process is costing employers thousands of dollars each year. I strongly favor the resolution now before this meeting to draw up an agreement whereby men who quit their work without just cause will be denied employment in other shops in this city."

Bill Holland was recognized by the chairman. "Such an agreement would probably create abuses greater than those it is designed to correct. It is an American tradition that a man be permitted to seek employment where he chooses. The contemplated action would drive skilled men with a just grievance from this city. Those who stayed would be restrained from the practice of their trade. In either case, the community would be the loser."

But Jennings, Works Manager of the Express Machine Company, spoke next. "If this agreement were made without qualifications to safeguard the men's interests, I would agree with Mr. Holland. But my understanding is that any man will have an opportunity to report grievances to a manufacturers' committee; if his reasons for leaving his job are well-founded, the bar against him will be lifted. The resolution is aimed at the chronic drifter who is not content to hold a good job when he has it—not at the conscientious worker. Properly safe-guarded, I favor such an agreement."

"Another point, I did not bring out," said Coakley, "is the practice of 'stealing' men from one shop by another. It's not uncommon for an employment manager to induce good men to leave another plant. Sometimes he pays a few cents more an hour, and sometimes the attraction is better working conditions or assurance of steady employment."

"It would seem," said Holland, "that you're not so much interested in protection against the drifting worker as in defense against each other. A man should be privileged to change his job for better pay, for improved working conditions, or for any other advantage. An agreement to restrain this freedom of action is an infringement on his rights."

"The agreement should be modified so a man may make a change to better himself," said Jennings. "But I think that if men realized they couldn't shift jobs for trifling causes, they'd be more content with their present work and settle down in one plant. In the long run, they'd become more valuable to industry and more likely to benefit themselves."

"If your plan succeeds," said Holland, "you'll destroy initiative. Often a man needs a new outlook on life to get himself out of a rut or to widen his experience. Few of you here are with the concern with which you started. If you keep a man cowed with the fear that if he loses his job, he cannot get another you won't secure his best effort. I don't believe you have an ethical right to take such action."

"We have as long as the men claim the right to group action in their demands," said Coakley.

Suggested by J. W. Hesketh, Coventry, England.

■

What Do You Think About This Problem?

How would you vote if present at the meeting described above? Employers' agreements as to hiring men exist in many communities. They are claimed to have decreased labor turnover and in this way to have rendered a service to industry. But is it right to restrict a man's choice of occupation even when his reasons for shifting may not be of the best?

. . . Discussion

of Executive Problems

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Is Propaganda Profitable?

An industry, not as close to public reactions as the public utilities and others in the same class, would do well to analyze carefully any benefits accruing to its particular field before investing in propaganda to influence public opinion. The cost is naturally an advertising expense and should be measured against the returns which might be secured if invested in other forms of direct customer advertising. At the present time, industrial propaganda has been carried so far that the general public has a surfeit of corporation and utility "education."

The metal-working industry would be very unwise to try to finance a move solely for the purpose of creating favorable public sentiment. Just what returns would the metal-working industry secure, and of what use would public sentiment be to it? Practically none. Advertising both direct and through trade journals, which reach the users of the products of the metal-working industry are investments which bring orders as returns. General newspaper advertising and broadcasting are shotgun methods; they are practically worthless and a drain on the advertising budget.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan Company.*

Home Work

The amount of time a man should devote to his work depends on his financial circumstances, his ambitions, and his aptitude for the work he is doing. To some men, an hour overtime is equal to a day's work. When the whistle blows they are through and they couldn't accomplish anything after that because their minds are elsewhere. When a man does not like spare time work, he should give it up altogether because he is depriving himself of the pleasure he does enjoy and accomplishing nothing.

The mind is always working and we may as well take advantage of this energy. Most every man has some hobby and he should spend part of his time enjoying it, regardless of whether it is hunting, fishing, bowling, or literature. When a man is so wrapped up in his work that he enjoys taking it home he should not deny himself that pleasure because other people believe he is working too hard.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Dole or Control?

It may now be asked whether the economic losses resulting from the inevitable period of liquidation which follows hard on the heels of inflated prosperity, can in some way be prevented. Cannot some theory be deduced which will enable unfavorable conditions to be forecast and their effects to be minimized?

Most financial losses result from the lack of knowledge of fundamental business conditions and the economic principles underlying them. Hence it would seem that there should be at least two definite methods for alleviating the difficulty. First, based upon definite study of the various important factors, tentative forecasts of business conditions may be made, which will prove of general value to all business concerns provided they are properly used. Secondly, the larger concerns may develop their own corps of experts, to study the problems peculiar to their own industry. For the smaller business units, perhaps the banks might act with mutual profit as constructive advisers regarding the problems of their business cycles.

Coming down to the solution of the most vexing problem of the turn of the business cycle, unemployment, job insurance is being used with some success. The important feature of this plan is the recognition of unemployment as a problem with which management must concern itself in the future. This reflects a change in thought on industrial ethics from the time when the sole object of management was to earn dividends regardless of the welfare of the employees or the community. As soon as enough business managers regard unemployment in the same light as they do accidents, we shall have as great improvement in the reduction of casualties resulting from one as from the other.

—GEORGE H. GUNN, *Naval Aircraft Factory.*

Anticipation Without Realization

The disappointment caused by the non-fulfillment of anticipation is more costly to the firms concerned than the savings effected. Long-service bonuses should not be surreptitiously dropped even when given purely as an act of grace. The institution of a new control in any firm causes a certain amount of uneasiness and nervous tension among some members of the working force, and it is always wise on such an occasion to make a frank statement of policy. It is manifestly unfair that the management should knowingly leave anyone in joyful anticipation of a bonus which is not forthcoming. If the head of a firm makes the men realize that there can be no sentiment in business, he must expect the same treatment in return. This means utter lack of loyalty on their part, no concessions or speeding up during a rush, and a heavy labor turnover.

—ROY VERNON WADE, *Glasgow, Scotland.*

Is Interest Important?

I have some doubt as to the value of the more complicated accounting systems in the conduct of a manufacturing concern. There is always value in getting a closer approximation of the true costs of production, but

so often one sees a whole string of camels, unobserved by the accountant, going through a hole in a scheme designed to separate all the gnats into their correct compartments. Whatever the result from an accountancy standpoint of charging 5 or 6 per cent interest on stock, the product still has to be sold at a competitive price. That being so, the interest charge seems to have no practical importance, for it is simply paid out of one internal account into another, and the total profit to shareholders remains the same. If the accountant is happy over this arrangement, there is no need for anyone else to have sleepless nights over it, which no doubt the president would have if total profits were reduced. —H. JAMES, *Birmingham, England.*

How Much Incentive?

There is no reason for not fully paying the profits made by an operator. Why give him only a part of the profits that he has realized? To reduce this excess when the ratesetter makes an error is not a sufficient reason. It is very difficult to establish rates correctly, but this must be done exactly or the ratesetter becomes useless.

When a piece or a series of pieces is given to an operator, he must know the time allowed him and be considered as a contractor with whom the factory has made an agreement. If it withhold a part of his incentive, he will never produce as much as when he receives it all, since his interest is not as great.

If instead of reducing the incentive, it increases as production increases, the operator will do all he can to produce the maximum, as he will be paid more for the last piece than for the first. If the operator earns a high salary, the factory gains even more because as production increases, general expenses diminish. Naturally, mistakes must not be made in setting the time, or the operator may make excess earnings without increasing production. —G. DESCOTTE, *Assistant Manager, Usines et Acieries Allard, Montigny le Eilleul, Belgium.*

Speculating in Personnel

In times of trade depression the best policy is to keep the key men as long as possible. If necessary to keep overhead down to the lowest level, it is better to make a temporary reduction of salaries all around than to dispense with some of the key men who are well paid, most of whom would prefer the reduction to being out of a job. When trade does become better, it is not always easy to replace these men and may take a year or so to train others to fill the same positions. Once a man has left a firm he is not always ready to come back again when they want him, especially if he has obtained another situation in the meantime. —J. W. HESKETH, *Coventry, England.*

Dole or Control?

Something must be wrong with the economic structure of society when such things as periodic troughs of unemployment continually recur. Jevons, the economist, pointed out that such crises are cyclical—they recur at intervals of nine or ten years—but the War profoundly disturbed the even recurrence of these cycles and England has suffered from a great depression ever since 1921. We have a glut of raw materials and manufacture; potential consumers urgently need commodities but are unable to satisfy their wants.

Periodic depressions are avoidable if the true causes could be found. Experts disagree about causes: They designate over-production, under-consumption, free trade, tariffs, mismanagement of currency and credit systems, rationalization, and high taxation. Just as widely do they disagree in their solutions.

In the meantime, the community and industry owes aid to the worker who is unavoidably discharged during depressions. He has been trained to be a specialist, a link in the chain of production, and is helpless in the face of such crises. Since the industry and the community are jointly responsible, they should jointly bear the cost of maintenance. Even machinery, during long periods of idleness, requires maintaining or it deteriorates. Industry cannot reasonably expect the labor market to supply all that it needs when a boom follows a slump, if it has neglected to make provision for the maintenance of that labor during its period of enforced idleness.

—A. W. KNIGHT, *Suffolk, England.*

The More the Brainier?

It is a hard thing to get a group of men or a committee to make a decision. As a rule, one man dominates the group, the rest following his lead. Hence he should be the one to make the decision. As a matter of increasing the efficiency of the organization, responsibility should be placed squarely on the shoulders of some individual. He should be trained to think intelligently and should not be interfered with as long as he gets results. Of course, he must have ability along the lines of his work. Often he will run into serious situations involving the solution of stiff problems, but until he asks for advice, the various Solomons in the organization should not butt in. Very often the different viewpoints of other men in the organization will cause new light to shine on the dark problem. But generally the comment and ideas offered in such a situation have been tried out and cast aside or are so unreasonable as to be almost laughable.

—L. O. BROWN.

The Urge to Merge

Mergers are the popular order of the day. They bring together work of similar characteristics under less executive supervision. Yet many large firms are losing business to the small jobber. Why? The main reasons are that their overhead is so great and their prices so high that the jobber can underbid. A jobber can also render immediate repair service. A break-down must be serviced at once, and in a large company, the order passes through so many hands, the customer gets out of patience before the order actually gets to the stores.

In a conference, one executive passed the remark, "we have grown too large to have close contact with our customers and to give quick and satisfactory service of maintenance." The small shop, therefore, is better off when it does not merge. —H. A. GILLILAND, *Hamilton, Canada.*

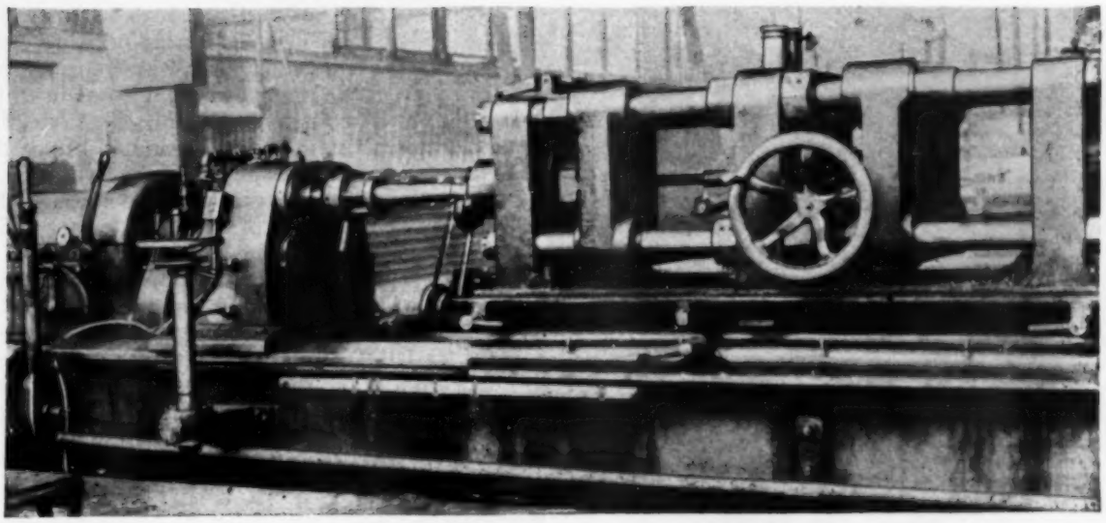


Fig. 1—By applying an hydraulically fed table carrying a massive indexing fixture and adding a duplex spindle head, this 24-in. lathe has been converted into a boring machine

Revamping a Lathe into a Boring Machine

A special horizontal boring machine, built with the bed and headstock of a 24-in. lathe as its nucleus, cuts to a quarter the time previously taken on multiple-operation work, yet increases accuracy

IN THE rock drill sharpening machine made by the Gardner-Denver Company, Denver, Colo., there are four steel castings. Each has a pair of 3½-in. holes that must register within close limits for the successful operation of the machine. These parts are known as the upper and lower die blocks, the piston, and the cylinder. It had been the practice to drill these holes in a radial drill, using a universal jig that would accommodate all four pieces, but this method was slow and not altogether satisfactory. It was decided, therefore, to build a special horizontal boring machine, using as a nucleus the bed and headstock of a Le Blond 24-in. lathe with an 18-ft. bed.

Essentially, the revamped unit consists of a duplex head with four sets of tools—drills, rough and finish boring bars, and reamers—and a massive indexing table, fed hydraulically. While one piece is being drilled or bored, the other is being loaded, and upon completion of the cycle the table is elevated upon a ball bearing and rotated 180 deg. by hand to bring the new piece into the operating position.

A general view of the operating position is shown in Fig. 1. To the right, just out of sight, is the hydraulic cylinder and ram, and to the left is the standard lathe headstock. Fig. 2 shows, from right to left, a set of tools in the order of their use. The corresponding operations are: drill 2¼ in. from the solid, rough bore to 3¼ in. finish bore, and ream to 3.500 —0.001 in. Center-to-center dimension of the holes is 4.125 in. ± 0.0025 in. A feed of ¾ in. per min. is standard for all operations on account of the close limits involved. All of the tools, as well as the additional parts of the lathe, were designed and built in the Gardner-Denver shop.

Bayonet connections are used for all the tools to facilitate their interchange. For gaging the depth, stop collars, adjusted by threaded locknuts on the shaft, are employed. With this system, the work-holding fixture is fed toward the headstock until the stop collars bottom, and after a brief dwell the table is reversed by manual control. Special provision has been made to prevent the building up of an excess pressure in the system when the table is up against a solid stop.

Details of the means for introducing coolant to the bars through the driving spindles are given at *A*, Fig. 3, indicating the stuffing box arrangement and the cork washer where the end of the bar contacts with the spindle. Instead of drilling a central hole through the bar, a groove is milled down the side and then covered with a plate that is later turned to the same O.D. as the bar. It is necessary, of course, to drill a diagonal hole from the end of the bar to meet this groove.

At *B*, Fig. 3, is shown a floating boring bar that is

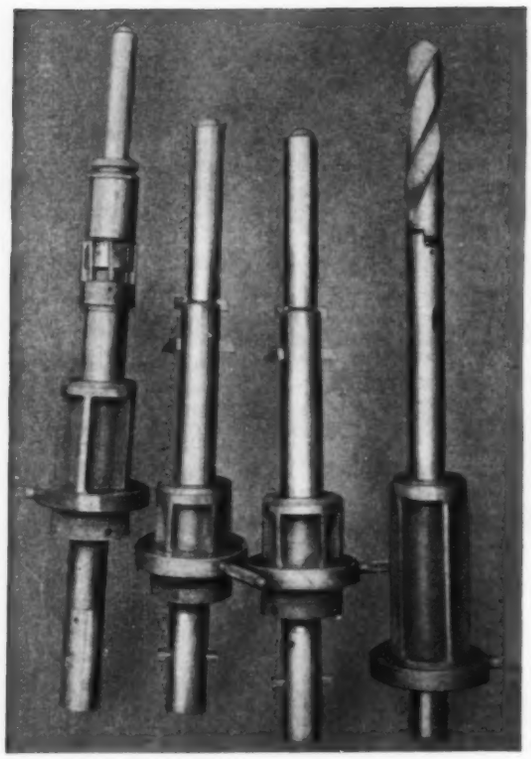


Fig. 2—Typical set of tools used in the duplex boring unit. There are two of each

used in place of the conventional spiral reamer for reaming the bores in the lower die block. This method of finishing assures a definite diameter, but because of the small tolerance on the center-to-center dimension of the holes, its success depends upon the accuracy of the previous finish-boring operation. One of the purposes of the rebuilt machine was to assure such accuracy. As the detail at *C* shows, a ball under spring pressure engages a V-notch in the cutter bar, thus centralizing the tool initially, at the same time allowing it freedom to float.

It is interesting to note that, besides the saving in time, there has been considerable saving in tool life on the new unit, largely due, it is thought, to the hydraulic feed—also to the fact that the coolant passes through the bars and floods the chips out of the cut. Formerly, on the radial, only six holes could be finished between reamer grinds as against 100 on the hydraulic boring machine, with a loss of only 0.00025 in. in size.

The duplex driving head, Fig. 4, is fastened on the ways of the lathe bed and is driven from the lathe spindle through the medium of an Oldham coupling. In order to get the same direction of rotation on the tool spindles, an idler is interposed between the central driving pinion and each of the driven spindle gears. All shafts are mounted on Timken roller bearings, and felt seals are employed at the shaft exits to retain the oil. The driving pinion is forged integral with the shaft, but the other gears are keyed on the shafts and held against shoulders by locknuts.

The indexing fixture is of exceedingly massive construction to resist all work loads. It is tied together by four steel columns that make it resemble an hydraulic press laid on its side. Sliding on these bars are two clamp plates, one at each end, actuated by screw pressure, the nuts or sleeves being turned by a worm and wheel from a handlewheel conveniently located on the side of the fixture. Various-sized adapter plates are used between these clamps and the work, according to its thickness, which may vary from $2\frac{1}{16}$ in. for the piston plate to $6\frac{3}{16}$ in. for the lower die block. These clamp plates also carry guide bushings for the boring and reamer bars.

Construction of the table support is shown in Fig. 4. Ordinarily the T-slotted table to which the fixture is

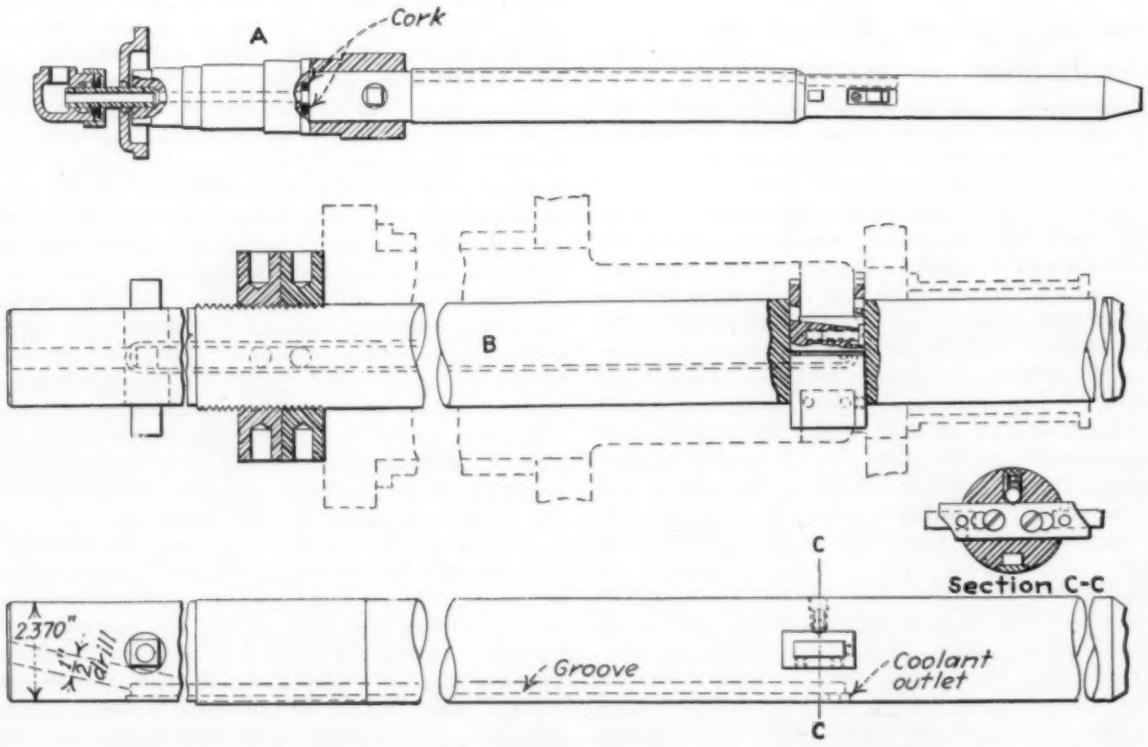


Fig. 3—At *A*, details of a typical boring bar, showing how the coolant is carried to the tools. At *B*, floating boring tool used as a finish reamer to hold to exact diameter

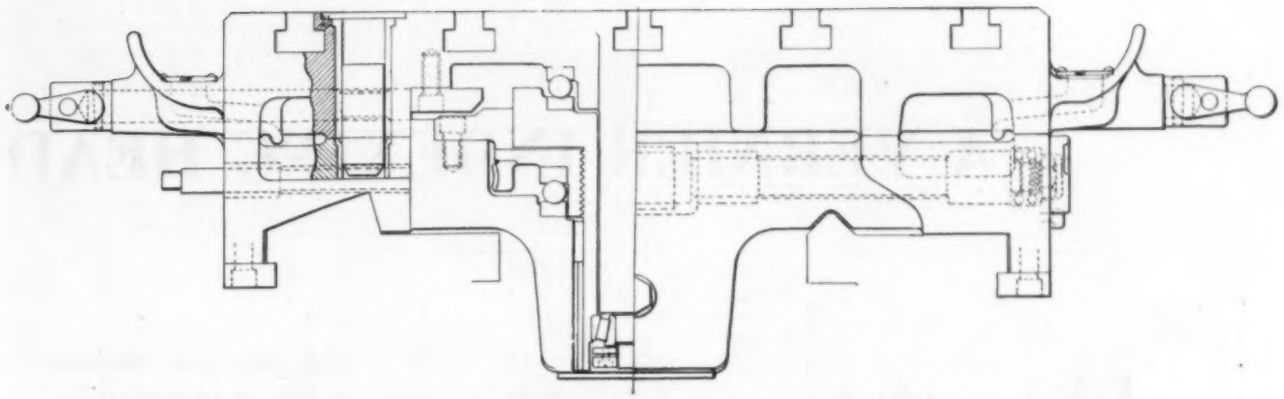


Fig. 4—By means of a worm and wheel actuating a screw sleeve, the table is elevated on a ball bearing for ease in indexing

bolted rests upon the ribs on the underside, but when it is desired to index it, provision is made for elevating it on a ball bearing. This movement is accomplished through a worm and wheel engaging a screw thread on the vertical support spindle. For radial stabilization a Timken bearing is placed at the lower end of the spindle, while the thrust is taken on two ball thrust bearings; one carries the thrust reaction of the screw, the other allows free rotation of the table in its elevated position. The worm is actuated by a lever brought out to the side of the slide. Two additional levers are provided for controlling the movement of four index pins which lock the table in each corner.

The table travel is controlled by a wheel and dial mounted on a vertical axis near the headstock of the machine, the connection to the pump valves being made by flexible wire cables. Any desired feed in either direction can be obtained. The pump and valve mechanism also is of the company's own design and manufacture.

The rebuilt machine has greatly reduced the production time, increased the accuracy of the product, and lengthened cutter life, making the investment entirely sound.

■

Keeping Machines on the Job

LUDWIG BEYER

THE DUTIES and functions of a maintenance department were discussed at some length in the *American Machinist*. The conclusion arrived at was that maintenance should be preventive instead of corrective, by means of periodic inspection and check-up.

It was asserted that the maintenance of machinery and tools in some of our up-to-date shops in the automotive, railroad, and airplane business was carried out 100 per cent. If taken literally, this would mean that a shutdown in these shops could only occur because of accident, never because of wear. With so many doctors, the services of an undertaker would seldom, if ever, be necessary.

It may be difficult to live up to such a system, but those who do not, lose considerable money.

From my limited observation it is my opinion that only automotive and airplane plants come anywhere near attaining the ideal conditions above mentioned. Railroad shops that I have visited impress me as being below the usual standard of the other two classes of factories.

The three industries mentioned, represent only a small portion of the metal trades industry, and it is obvious, therefore, that there is much to be done in bringing up the general average of efficiency.

Not only repair and maintenance of machinery is usually neglected, but also another important factor, that of the maintenance of cutters and cutting tools. It is surprising how little attention is paid to this important subject by anybody from the management that buys them, down to the operator who uses them. I have had this impression ever since I began specializing in tool-grinding back in 1911. I have worked in large shops both here and abroad, and only once in this country have I been employed in a plant which made a sincere effort to keep its tool maintenance 100 per cent perfect.

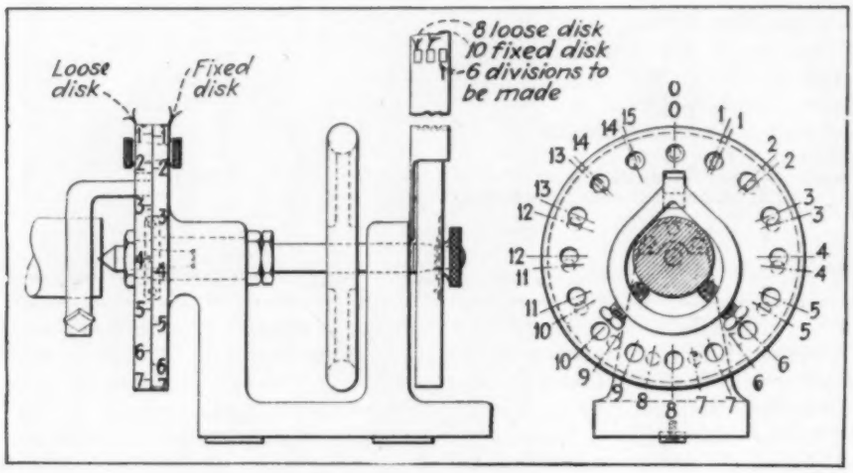
In the particular plant mentioned, a large force of men were employed in reconditioning tools of all kinds. It was conducted on a manufacturing basis, with proper inspection and supervision. Experience had shown this firm that it was more economical to purchase tools from those whose business it was to make them than to make them themselves, and they also found it was not economical to neglect them after they were bought.

In practically every other plant, I found conditions to be almost the reverse of this. Very little or no attention was given to proper grinding of tools, and no supervision seemed to be exercised over their use in the production departments. In some of the plants many of the tools were home-made, which I consider a doubtful economy. In these same plants, poor equipment, poor heat-treatment, and lack of supervision were bound to handicap production further by producing a poor tool.

As a result of my own experience I am led to ask why a firm will invest in up-to-date production machines, and neglect the toolroom machines that must be depended on to make the production machines efficient? Or why they will use dull or mutilated cutting tools on good production machine tools? What will be the result in the long run? What happens to the power bill? Why is the tool and cutter grinding operation neglected in most plants? There must be a reason. The only one I can see is poor education in this matter on the part of shop executives.

The machines designed and sold for grinding tools and cutters are up-to-date and good production machines, but either the sales resistance of management or the sales effort of the manufacturer seems to be at fault.

A VERNIER INDEXING HEAD



D. Q. Dunstone
Hetton-le-Hole, England

Old principles continue to bob up in new guises. This indexing head carries two disks, one with sixteen holes and one with fifteen. Suitable combinations permit the division of a circumference into 240 parts or any factor thereof. An ingenious indicating device safeguards against error in hole selection

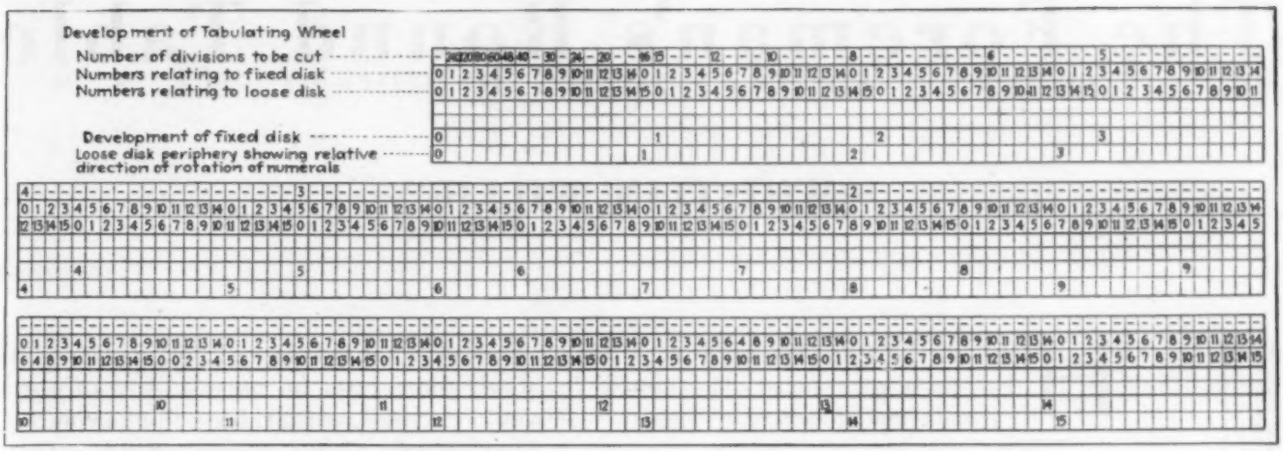
AN INDEXING head embodying the vernier principle is illustrated in Fig. 1. It is intended for use on a milling machine, or on any machine or marking table where the division of circular work is done. The main body of the head is an iron casting, integral with which the fixed disk is cast. Keys are fitted to the base to insure alignment of the head and the tailstock upon the machine table, which has a machined T-slot. Two holes for holding bolts are provided in the main casting. The spindle bearings are bored concentric with the fixed disk and in alignment with the keys. Adjacent to the fixed disk, another disk (which will be known as the loose disk) is keyed to the spindle and is secured by means of a nut. A ball thrust-bearing is located between the two disks to prevent heavy contact and friction between them. An elongated slot in the loose disk serves for the tail of the dog rotating the work.

The system of spacing the holes in the disks insures accuracy, simplicity of manipulation, and provision for a wide range of indexing relative to the number of holes used. On a pitch circle of suitable diameter, sixteen equidistant holes are taper bored in the loose disk, all holes being of the same diameter. On a pitch circle of the same diameter, fifteen equidistant holes are taper bored in the fixed disk, the size and taper of all holes being a continuation of the ones in the loose disk. A taper pin is provided to fix the two disks together through one pair of holes, knurled nuts at the ends are provided for tightening or extracting the pin.

At the rear end of the spindle, a wheel is fitted to a taper seat and is secured by means of a knurled nut, no key being fitted. This wheel is known as the tabulating wheel; if desired a printed indexing table may be used in place of this part of the device. A series of numbers referring to holes in the fixed and the loose disks, and to the numbers of the divisions to be made, is stamped on the periphery of the wheel. A development of the peripheries of the loose disk, the fixed disk, and the tabulating wheel is shown in Fig. 2. It gives the correct arrangement of the numbers on one disk in relation to those on the other. The wheel is provided with a shield having apertures through which the numbers may be seen. A handwheel attached to the spindle is provided for its rotation. A tailstock of conventional design is used in conjunction with the indexing head.

In operation, the zero hole in the loose disk is brought into line with the zero hole in the fixed disk, and the index pin is placed through these holes. The tabulating wheel is then loosened from the spindle and is turned until the number of divisions desired can be seen through the aperture "Divisions to be made." The wheel is then tightened on the spindle, and its position on the spindle must not be changed during the operation of indexing.

For example, if the number of divisions is six, turn the tabulating wheel until the figure 6 appears through the proper aperture, and lock this wheel. The work is now in position for the first cut. For the second position, read the numbers relating to the fixed and the loose disks through the apertures so marked. They are 8 and 10, respectively. Remove the index pin from the disks and turn the handwheel so that 8 on the loose disk coincides with 10 on the fixed disk and reinsert the index pin here. The second position of the work can now be cut. For the third position, read the numbers in relation to the disks that now appear through the apertures in the shield and set the disks to the numbers given. This operation automatically brings the numbers to be used for the fourth position into view


Development of Tabulating Wheel
Number of divisions to be cut
Numbers relating to fixed disk
Numbers relating to loose disk
Development of fixed disk
Loose disk periphery showing relative direction of rotation of numerals

through the apertures of the shield. Repetition of these operations are continued until the work has been fully indexed, each setting causing the numbers for the next setting to come into view.

With this indexing head, the number of divisions that can be made is 240, or any factor of 240, where 15 and 16 are the number of holes in the respective disks.

■

More Chips from Tungsten-Carbide Tools—*Discussion*

I. F. Herbes

Assistant Superintendent, Allen-Bradley Company

RECENTLY there has been a lot of interest shown in tungsten-carbide tipped tools and their application. Numerous articles have appeared in the various trade publications, giving different opinions and uses for this cutting material. We thought that our experiences would be of interest to other readers of *American Machinist*.

In the past four years, we have applied tungsten-carbide tipped tools to a number of different jobs that had been a constant source of trouble. In applying tungsten-carbide to these jobs, we used the same speeds and feeds that had been used for high-speed steel tools, which in most cases, were also the capacities of the machines.

For drilling and turning fiber and bakelite rods on Brown and Sharpe automatics, we found that in all cases tungsten-carbide was more economical to use than high-speed steel; for certain jobs of turning it equalled a diamond tool. For drilling and turning copper rods on Brown and Sharpe automatics, it lasted twenty-five times longer between grinds than high-speed steel. On turret-lathe work, drilling and turning brass forgings and bronze castings, it gave the same results as for turning copper on the automatics, namely, a twenty-five-time increase in life between grinds.

We equipped several sixteen-spindle drilling machines with tungsten-carbide tipped twist drills; these machines are used for drilling holes in electrical slate panels. When using high-speed steel drills, it was necessary to resharpen them after drilling seventy-five panels; with tungsten-carbide tipped drills we could drill seventy-five hundred panels before resharpening the drills. The life of tungsten-carbide tipped drills was forty times that of high-speed steel drills. This was our most remarkable application.

We are using tungsten carbide for special boring tools that remove a one-eighth inch thick vitrified surface from the inside of a steel cylinder. This is similar to cutting a vitrified grinding wheel. Some of our other uses have been to drill holes through Pyrex glass $\frac{1}{4}$ in. in thickness; also $\frac{5}{32}$-in. holes $\frac{1}{8}$ in. deep in spark-plug porcelains. We have used this material in the following types of cutting tools and found it to be practical for our use:

Solid-shank turning and shaping tools
Tool-holder bits
Straight and twist flute drills
Reamers and counterbores
Circular form tools, solid and built-up types
Scriber points

Our applications of this material have not always been successful, but by trials and observations we were able to adapt it to a number of jobs successfully.

■

Eliminating Static Electricity from Belt Drives

THE Bureau of Chemistry, Department of Agriculture, has done a great deal of work with a view to eliminating the danger from static electricity in certain industries, according to Industrial & Engineering Chemistry Journal for August, 1930. The department found that by dressing a belt thoroughly with a mixture of lamp-black, or carbon, and fish glue, a surface could be imparted that would conduct the charge from the belt to the pulleys and then, by grounding the equipment, the charge could be led off as fast as it accumulated. While this method has considerable merit, it requires frequent dressing of the belt to assure the desired results.

According to Roy C. Moore, chief engineer of the Chas. A. Schieren Company, however, a static-proof belt has recently been developed in which a row of copper wire stitching along each edge of the belt makes contact with the pulley faces at all times. In this way, static charges are led off through the belt by means of the stitching. It is then necessary only to ground the machines.

The Foreman's Round Table

"WHISTLIN' WILLIE"

"HELLO, Whistlin' Willie!" laughed Ed, as a grim-faced Al stepped through the doorway.

"So you've heard about that too," countered Al. "Television isn't so far distant as I'd thought. But how did you hear about my argument with Phillips? It only happened ten minutes ago."

"You've got to remember, Al, that when a foreman bawls a man out for whistling, it's sure to spread like wildfire. Imagine not letting a fellow bust loose and whistle once in a while! And you call me narrow-minded!"

"Now listen, Ed, before you give any of your snap judgments, you'd better hear both sides of the question. This isn't the first time Phillips and I have had this thing out. He's a chronic noise maker—I'll bet he talks out loud in church."

"Well, you old crepe hanger! You must be real upset about this thing, Al."

"Believe me, I am. Phillips is continually setting up a job so it rattles, putting in his drill-press back gears so they roar, banging steel plates on the floor, or trying to whistle —anything to make a racket. He drives me half crazy sometimes and he gets the other men all on edge."

"Bunk, Al, you're just getting old. Are you another one of these noise abatement hounds that have been blowing so much lately?"

"Well, what if I am? Look at the results of all these tests on noise. Any of them would convince even a thickskull like you, Ed. They've proved the clack-clack of a typewriter will cut down an executive's efficiency as much as 30 per cent, that noise distracts and wears out any kind of a worker, and that most of it is entirely unnecessary. Why, I was reading the other day in the *American Machinist* that the Simonds Company is going to put cork pads under all the drop hammers and mask other sounds so that the shop office can be put right in the same building, without a partition."

"But who wants the shop office in the same building, and without a partition? Wouldn't that be nice! They'll have all of us wearing rubber shoes and talking in whispers next. And if noise is so wearing, why is it that boiler makers live to such a ripe old age? A lot of us would go crazy if there wasn't any noise! Did you ever try to sleep out on a farm? Say, I'm used to noise; I like it; it makes me feel at home. And besides, I like to hear a man whistle or sing; it puts everybody in a better humor, and it shows the men are satisfied too."

"It doesn't show a thing, Ed. It's only good management to keep a man from being distracted by noises around him. Silence means greater production, better working conditions, and in the end, better pay."

"Why, Whistlin' Willie! You'd better go home and muzzle the canary!"

Does the worker become inured to noise? Can it be lessened to any appreciable extent in the average shop? Will the effort gain anything?

▸ ▸ ▸ Discussion of Former Topics

Going Soft

Management is not legally required to give labor any consideration when business is slack. It is, nevertheless, to the advantage of management to do all it can. It should gain by keeping the men steadily employed or at least on the payroll, because turnover costs and the cost of breaking in new men when business picks up are apt to be excessive.

Whether reduced hours or actual lay-off should take place should be determined by the degree of dependence which the workers have on the employment offered.

The character of the business depression should also be a criterion in determining the means of reducing the output. If the depression is general and of long duration, available resources will soon have been used up in keeping the men employed.

As to what would happen to the marketless products turned out when empoyment is continued in spite of a business depression, it might be observed that they would be used up eventually if economically justified in the long run. There would be a contribution to the faster return to normalcy by maintaining purchasing power of the working force and there would be a decided tendency to prevent periods of industrial inflation since the load factor of the industry would tend to be constantly on the average rather than on the peaks or in the valleys. For producing the same amount of product, a smaller, but more steadily employed force would be used.

—MILLARD F. SAXTON, *Allis-Chalmers Mfg. Company.*

From Another Angle

Clearness and easiness to read are the principal requirements of drawings for shop use. I consider a two-color print paper excellent for shop use because it is much easier to read.

After prints have been in the shop for some time the dimensions often get blurred and are difficult, if not impossible, to read. I have used the practice of marking in the dimensions in red ink, after the drawing is printed. This makes the dimensions much clearer after the print has been in the shop some time.

—W. E. WARNER, *Essex, England.*

Who's Who in Industry

Most mechanics will agree with Al that single-action jobs do not require the skill or attention to detail that toolmaking does. In England at least, skill is not the factor which fixes the standard of life. Hard toil, the dangerous nature of the job, such as mining underground, are still less factors. I have four male members in my family, the eldest a printer, next a miner, another an engineer, and the youngest a plumber and electrician. The miner receives 9 shillings ($2.16) per shift of 7½ hours. He likes the job and is satisfied.

The lithographic printer receives 5 pounds ($24.30) for a 47-hour week, a nice easy job: nearly all the work is done by the press.

The machinist (engineer we call it) receives $0.33 per hour for a 47-hour week, that is $15.51 per week. This work is skilled, needing great attention to detail, including a lot of experimental work. Both these boys work in the same shop. The other son's job, the plumber, gives him 1/8½ per hour for a 44-hour week in winter and 47 in the summer, or $19.44 per week all the year round.

What then is the factor which fixes the amount of pay in this country. The printer will have his answer ready in a minute. "Pay your unemployed brother a sum per week on which he can live. Then he will not be at the factory gate waiting to undersell you." The miners are unorganized, and there are 200,000 more men than the industry requires: competition for jobs results.

The engineers' union has 14 per cent of its members unemployed, and there are thousands outside the union. Competition for work results in low pay. On the other hand, the plumbers are well organized, but have many unemployed. These are not allowed to take work at less than the district rate, however. In this district, which is mainly mining and hosiery (one a dangerous dirty job, the other a nice clean job) the hosiery man gets his $30, $35 and even $40 per week. The miner has his 9 shillings per day. This gives you the reason why the trade-union movement is strong there. For without collective bargaining, the employer pays to labor as little as he can. I have never been in America, and do not know the conditions there which govern the wage paid, but I feel sure that when there is more work than men to do it, wages will be higher. —T. SMITH, *England.*

The Worm Turns

Every worker hates the drone; every producer hates the non-producer or what he thinks is a non-producer.

Certainly at this time the greatest care must be taken when laying off help. Men who have been laid off, who are on short time, or who are wondering when they are going to get it, will look askance at any expense by the management that seems unjustifiable.

At these times, management should check up on welfare work and cut it to the bone before laying off other help. The next step should be to show the men where their benefit comes in and, if it is a big job to prove its advantages, cut out the welfare.

There is in our city a firm whose welfare department supplies coal for the needy, administers medical assistance, etc. Everybody at the plant knows it, and no one is kicking.

Another firm in our city has been criticised for spend-

ing money on landscaping that might be used for paying wages to their help, but investigation showed that no new plants or shrubs to speak of had to be bought, and that factory help that would otherwise walk the streets, was employed to do the work. That is real welfare and satisfies all concerned.

Welfare work, now that the war is over and we have come down to earth, should be peeled down to taking care of distress cases, and all paternalism should be cut out. —J. C. P. Bode.

Doleful Times

Mechanical efficiency has developed industry to such an extent that the social and financial machinery, which functioned more or less successfully in the past but failed to keep pace with the progress in industry, has now broken down.

Competition has compelled manufacturers to make use of automatic machinery and labor-saving devices, until we have reached a condition in industry in which the man-hours of human labor necessary to keep it going on a given scale have been considerably reduced.

This reduction in man-hours is in itself not a danger, yet the effect has been that each worker replaced by machinery is just that much purchasing power lost. The displacement of workers by the technical arts is faster than can be absorbed by other occupations.

Machines are wonderful producers, but they are not consumers, and it is futile to keep on making goods that cannot be sold.

In industry we have been very careful to reward those highly who could increase productive capacity, and have used our greatest efforts to reduce to a minimum the number of workers required, but we have completely overlooked the equal necessity of providing adequate purchasing power.

The problem today is not one of over-production, but rather one of under-consumption.

Unemployment, then, is not a necessary condition of human society; it is a maladjustment of its machinery, a disgrace to our intelligence.

—R. A. Maxwell, *Quebec, Canada.*

Experience or Authority?

When a man has special experience, no matter what his rank in the company, special provision needs always to be made if the full and proper use of this experience is to be at the service of his employer.

Take first the question of going against the rule that tools should be ground in the tool crib. As soon as it becomes apparent that a new man knows more about grinding his own tools than the tool crib boss, it should be the immediate concern of the foreman to see that this knowledge is somehow acquired by the tool crib boss with the active co-operation of the new man. Special kinks for grinding tools for special jobs are bound to remain the exclusive knowledge of the mechanic, and it should be understood by all concerned that special jobs justify the tool crib rule being waived to allow the tool grinding in the special way required.

Similarly, maintenance of a machine which is operated by a man who really knows it thoroughly can safely be left to him. Nevertheless the maintenance mechanic is in a better position to do the work in every way, other than the knowledge of what to do, and how to do the necessary work. He has access to all that maintenance facilities mean in a well organized shop and knows the general maintenance policy of the shop. So, the foreman once again must see that the mechanic's knowledge of his machine is somehow placed at the disposal of the maintenance mechanic, even if it means that he has to obtain it himself from the mechanic and then pass it on to the maintenance mechanic.

In short, if there is special experience concentrated in one man it is to the company's interest to use it in the best way possible. This way is certainly not to allow the man to do work outside of his proper sphere but definitely to insist on the man co-operating with the specialist men on tool grinding and maintenance, even though on his particular line of work he may be supreme.

—S. A. Knight, *Khurmatu, Irak.*

Check and Double Check

Keeping track of small tools is a problem in any shop. Even in the best regulated systems there are times when all the available gages or "mikes" of a particular size are out. Generally when this happens, some bird at the other end of the works will want the same gage. After walking the length of the shop and asking for the use of that gage, he will be refused unless he can tell some new stories. If he can't get what he wants, he will report to his foreman, who will make arrangements with the other foreman and then an apprentice or sweeper will bring the desired tool without much loss of time. It would be very foolish and expensive for a shop to have enough tools for each department, which would be used only occasionally. It is just an unavoidable evil when two different departments want the same tool at the same time. —H. Forschner.

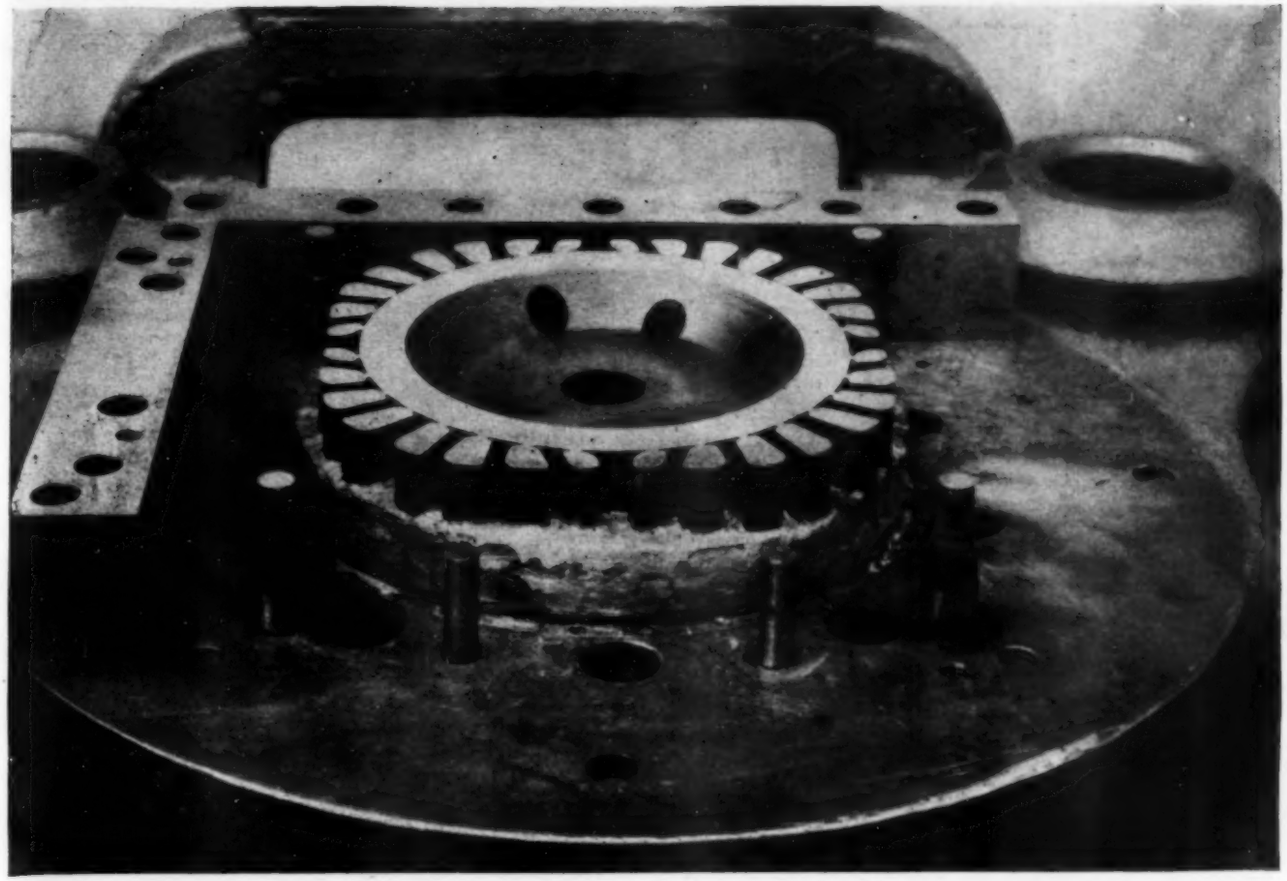
In the Driver's Seat

So many factors can and should influence a foreman's attitude to a man in error that a hard and fast rule is impractical. The man's record, length of service, and mental disposition should by all means be considered. Hasty action is conducive to unfairness and poor training.

If the man is still in the period of training provided for a new employee, the foreman's problem is to decide whether or not the man will eventually become an asset to the company, and if he decides against it, the man should be dropped from the pay roll immediately.

A man often feels so keenly concerning his error that disciplinary action is not only unnecessary but harmful. I remember once having the misfortune to make a serious blunder while doing an important job. Realization of my error so filled me with mortification that if my foreman, who happened along at the moment, had offered one word of condemnation, I would have quit then and there. That word was not spoken, but I was sent off on some unimportant mission which gave me a chance to cool off, after which, of course, I was anxious to make amends and regain my self-respect. The incident was valuable in that it taught me always to note the mental reaction of a man making an error before deciding on disciplinary action.

—Gilbert G. Coombs, *Mexican Petroleum Corporation*



FOR THE DIEMAKER—

A non-shrinking matrix that will melt at 248 deg. F., yet withstands peening

H. W. LANCASTER
Tool Supervisor,
General Electric Company, Pittsfield, Mass.

HARDER than lead, yet meltable with steam or a blowtorch flame, a new alloy for tool and die work is finding increasing application. Diemakers long ago dispaired of finding any metal capable of fulfilling their exact requirements. Mechanical holding arrangements or one-piece construction of complicated punches and dies were either virtually impossible or prohibitively expensive, and the available matrix materials to be melted around parts were either too soft, shrunk in cooling to such a degree that they failed to support the part, or melted at such a high temperature that they drew the temper of the die parts. Type metal has been used with a degree of success, but has a high melting point; Woods metal is too soft and peens too easily.

Matrix Alloy, developed by the General Electric Company, has the unique property of expanding slightly upon cooling. In addition, it overcomes other objectionable features of the earlier materials tried for the same work. The alloy holds die parts firmly, yet permits their almost instant release whenever the need for changing them arises, without any danger of drawing their temper.

This material has a tensile strength of 13,000 lb. and registers 19 on the Rockwell E scale. It has an elongation of one per cent and a melting point of 120 deg. C. (248 deg. F.). An analysis submitted by the Cerro de Pasco Copper Corporation, suppliers of the material, show its content to be 48 per cent bismuth, 28.5 per cent lead, 14.5 tin, and 9 antimony. The melting point may be raised or lowered by varying the bismuth and antimony contents. Bismuth imparts the expanding feature.

Many practical applications are being worked out, among them the one illustrated. This particular die incorporates some 32 irregularly shaped punches which would be difficult to hold by ordinary means. During its assembly, the punches were held by a single small locating screw at the bottom of the plate while the melted alloy was poured around them to half their height. The dam for holding the hot metal in place was made of a circular strip of steel, slipped over the die in the same manner as in pouring a ring bearing of babbitt. When the punches are worn down so that the alloy interferes with punch operation, the alloy is melted away with a blowtorch or steam. It is of course essential that no alloy is allowed to penetrate beneath the punches.

Frame members pass down this line of radial drills on their way to the assembly line

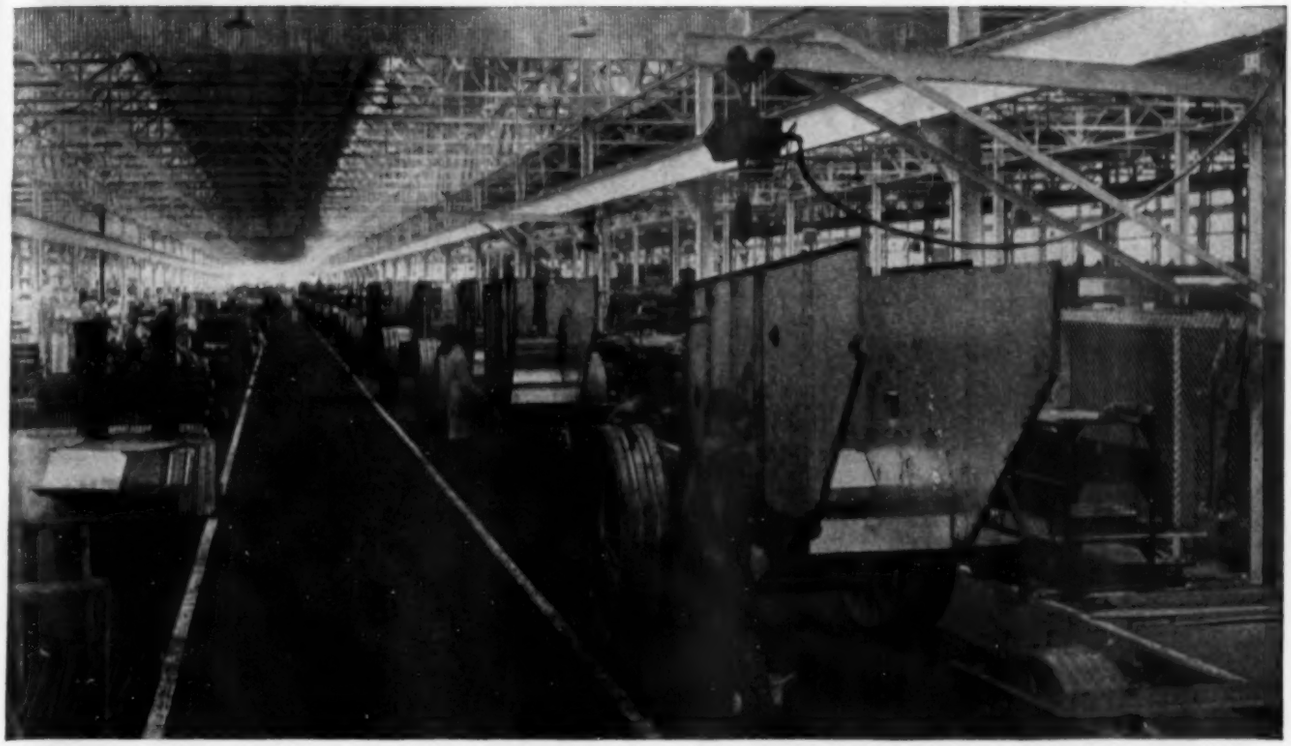
LOTS OF SPACE NEEDED FOR HARVESTER CONSTRUCTION

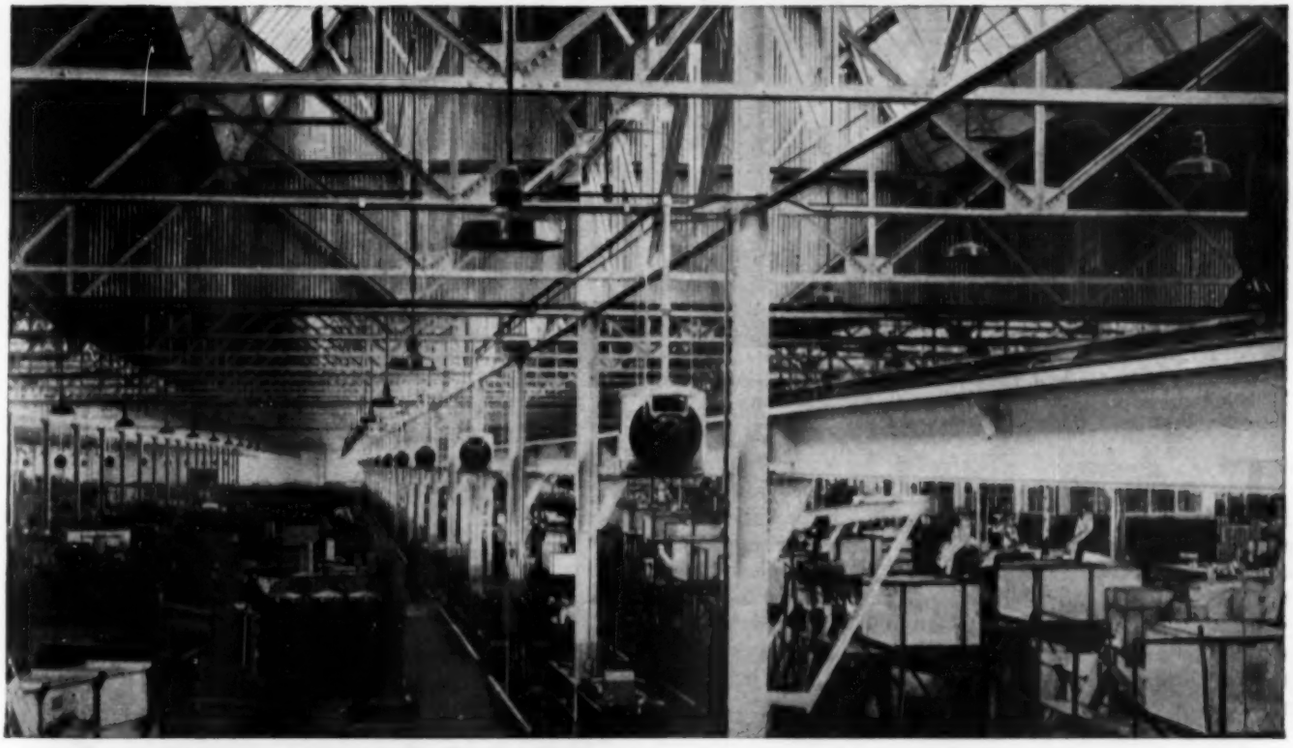
THE NEW combine harvester building of the Caterpillar Tractor Company, Peoria, Ill., was probably the largest single industrial building erected last year. Measuring 1,190 ft. long by 475 ft. wide, it has 14 acres of floor space under one roof. Because of its size, the building is divided into six parts with expansion joints in between the units, and baffle walls at the top extending from the roof to the base of the trusses as a precaution against the spread of fire. Side walls are almost entirely of glass with center pivoted sash, and the roof is of monitor construction with top-hung sloping sash. Altogether, 180,000 sq.ft. of glass was used in the construction of the building. Other statistics include: 2,600 tons of steel, 1,730,000 sq.ft. of lumber, and 492,000 sq.ft. of wood floor blocks. In the front of the building is the largest showroom in the world where samples of the company's entire line of road and agricultural equipment are on display.

The body of a combine harvester is made up largely of sheet metal and structural shapes with a number of rotor elements and conveyors. On the castings few surfaces are finished. Machine tools are therefore scarce in such a shop. Many of the units are purchased parts, and those pieces fabricated in the shop itself are often bulky. By far the greater amount of space is devoted to the storage of parts awaiting assembly.

Assembly takes place progressively down a center aisle, and in adjacent sections finished parts are stored in the order of their use. To the extreme right of this line, and against the wall, is an inside railroad track, depressed 4 ft. under the floor, where completed harvesters are shipped out. On the other side of the assembly line is a scattering of machine equipment. Beginning at the front of the building, for instance, there is a group of radials for drilling frames; next a series of presses and punches, also for forming structural shapes. Other equipment found includes spot welders for sheet metal, an electric forge furnace, bulldozers, sheet metal forming machines, and woodworking machinery.

The principal bays are served by overhead bridge cranes running the length of the shop. Auxiliary lifting and conveying facilities are air hoists mounted on jib cranes or fixed I-beams. Because of the large amount of glass used and the use of white paint on all exposed steel 6 ft. from the floor, lighting is excellent by daylight. Electric lights in enameled reflectors are provided on 20-ft. centers and unit heaters are mounted on every other column.



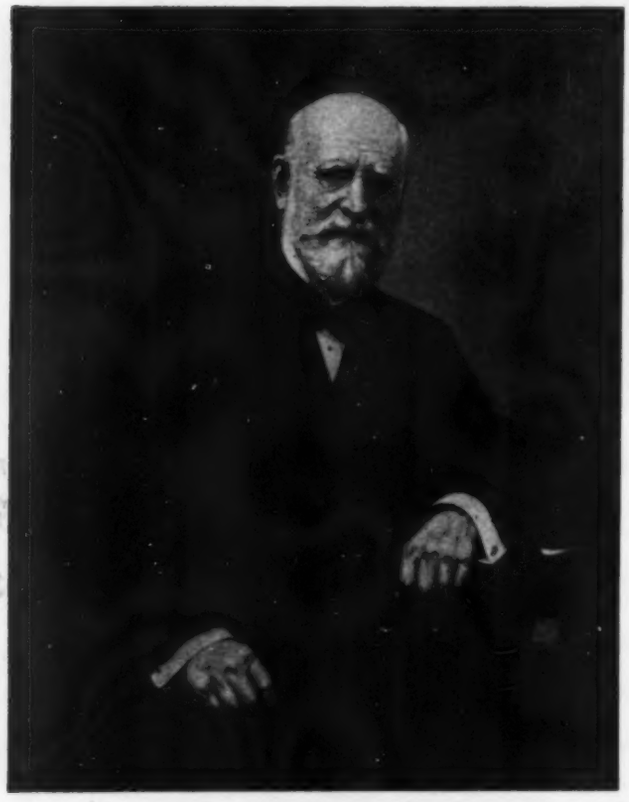


At top—Early stages of assembly. The side frames are assembled as a unit in an adjacent bay and are lifted into position by the air hoist on the jib crane

Harvesters nearing completion at the far end of the line. This view also gives a good idea of the lighting and heating facilities

Photographs by courtesy of the Caterpillar Tractor Company and The Austin Company

BULLARD —
A Man and an Organization



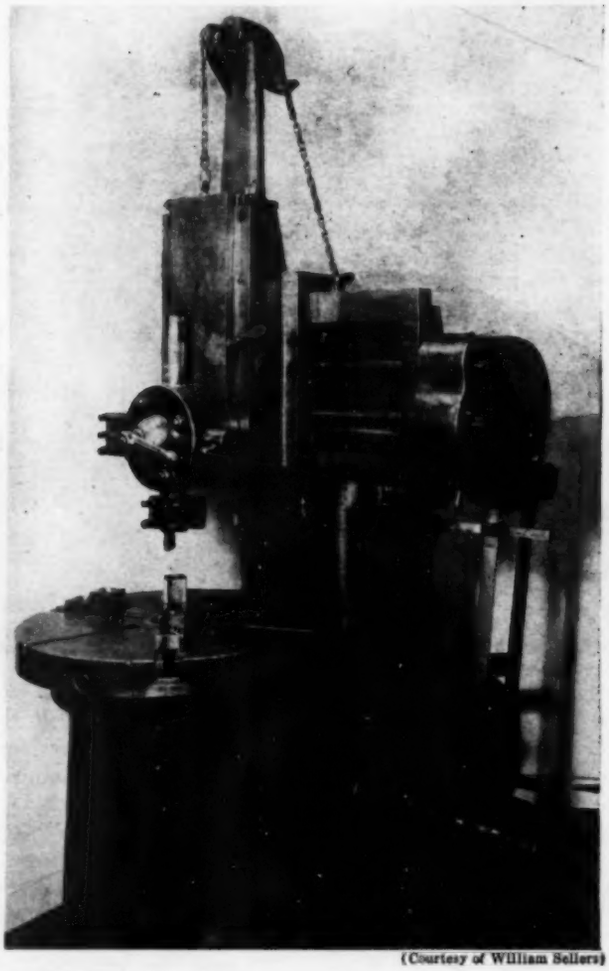
Edward Payson Bullard, founder of The Bullard Company. From the portrait in the main lobby, Administration Building, Bridgeport plant

"THE story of the metal-working industries is a story of machines and men"—particularly of men. This statement, even more true of the machine tool industry, applies directly to the man who founded The Bullard Company, Edward Payson Bullard. Even though his death in 1906 brought to an end an exceptional mechanical career, his ideas and methods have profoundly influenced the entire tool industry, as well as the organization which is now celebrating its fiftieth anniversary. His successors have recognized his leadership by placing on the bronze tablet beneath his portrait in the lobby of the new Bullard administration building this sentence, "His genius and foresight still guide our progress."

Born in 1841, Edward Payson Bullard began his mechanical career as an apprentice at 17 in the Whitins Machine Works, Whitinsville, Mass. Upon completing his apprenticeship, he entered the employ of Colt's Armory at Hartford, Conn., from which so many of the machine-tool pioneers emanated. Later, he was employed by the Pratt & Whitney Company.

Together with his mechanical ability, he possessed the New Englander's inherent instinct for trading, one of his early experiences being the sale of machinery and equipment obtained from an arsenal just after the close of the Civil War. From this beginning he entered merchandising, subsequently deciding that in order to insure getting the machine tools he wanted, he must build them himself. Accordingly, he established in 1880 the Bridgeport Machine Tool Works, which was incorporated four years later as The Bullard Machine Tool Company. His first product was lathes, some of which are still in use by users who do not believe in obsolescence. His first great success, however, was the application of the vertical boring mill principle to smaller unified machines of vertical type having a wide range of adaptability and great flexibility of tooling. These same principles,

An early Bullard boring mill, now in the Museum of Science and Industry, New York City



(Courtesy of William Sellers)

The Bullard employees of 43 years ago, a group photograph taken in 1887

changed in accord with today's mechanical advances, are the basis for present Bullard designs.

In December, 1906, Mr. Bullard passed on, leaving the traditions and future of the company to his sons.

Some of the present employees of the company began under the founder, a few having been with the organization for almost fifty years. A working basis for employee relations worthy of adoption by other organizations is the Bullard policy which reads: "First, that respect and confidence between employers and employees shall be established and maintained; second, that a profitable and equitable incentive must be provided for both; third, that there must be established a measure for determining a rate of wage; and fourth, that the rate of wage must be definitely related to the energy, skill, experience, and knowledge required to perform the work."

Stanley Bullard, Vice-President, said in regard to Organization recently, "Analyzing, planning, and developing along the 'human' lines brings in wonderful possibilities. For successful manufacture, an effective, comprehensive organization is indispensable. Many manufacturers have, however, developed plans and organized around them, and in a general way attained comparatively large success in getting out the product as scheduled, but through a blind working of the plan alone may have missed the larger measure of success which would have been theirs if the plan itself had been developed around the trained personnel available within the organization as it existed. To obtain and to increase productive capacity is not merely a problem of plant equipment, power, and the number of operatives, or of the increase therein, but rather one involving the retention of operatives and the increasing of their skill and ability through a constantly growing knowledge of the work in hand and the upbuilding of team-work and co-operation."

The Bullard organization, at the time of the World War, was called upon to build and equip a plant for the manufacture of 155-mm. guns of the French model. The plant was completed in record time but the close of the war ended this chapter, and the gun plant became the basis of Bullard's present-day machine tool plant.

AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

Report No. 22—Makers of Conveying and Transmission Equipment

THIS division covers manufacturers of conveying machinery, cranes (including hoists and derricks), elevators and elevating machinery, industrial trucks and mine cars, and transmission machinery. For the inventory made in 1925, this group was included with makers of "other machinery and parts" so a direct comparison cannot be made between the present and previous reports.

The 51 per cent of equipment shown over ten years of age is higher than the 44 per cent average of all industries obtained five years ago. Turning machinery predominates with drilling, grinding, power presses and milling machines following in the order named. These groups, together with hand presses, constitute over 70 per cent of all machines in place. Conveying and transmission manufacturers are very nearly equal to the textile machinery manufacturers as users of machine tools, each division having over 22,000 pieces of equipment installed as of 1930.

Machines for Making Transmission and Conveying Equipment

	Total Number in Plants 1930	Number Installed Before 1920
LATHES		
Engine	2,489	1,540
Hand Turret	204	105
Power Turret	619	141
Automatic and Semi-Automatic	190	
Chucking (Not Chucking Machines)	42	21
Speed and Bench	190	120
Crankshaft		
Toolroom Type	197	70
Other	14	
CHUCKING MACHINES (Not Chucking Lathes)	225	49
SCREW MACHINES		
Hand	239	141
Automatic, Single Spindle	696	506
Automatic, Multiple Spindle	169	56
CENTERING MACHINES	98	63
MILLING MACHINES		
Hand (No Power Feed)	274	169
Bench	7	
Plain (Knee and Column Type)	415	155
Universal (Knee and Column Type)	274	134
Vertical (Knee and Column Type)	42	14
Lincoln Type Manufacturing	176	127
Continuous, Rotary Table or Drum Type	14	
Planer Type	42	14
Other	14	7
GEAR CUTTING MACHINES		
Rotary or Milling Type	169	105
Hobbing	204	21
Planing or Shaping	70	14
Other		
BORING MACHINES		
Horizontal Boring, Drilling and Milling	176	70
Vertical Boring Mills	436	190
Other	7	7
JIG BORERS		
DRILLING MACHINES		
Radial	548	295
Upright, One Spindle	1,730	1,048
Upright, Two or More Spindles	394	84
Upright Gang (Two or More Heads)	84	7
Sensitive, One Spindle	661	352
Sensitive, Two or More Spindles	105	56
Sensitive Gang (Two or More Heads)	91	42
Two, Three and Four Way	7	
Other	28	14
THREADING MACHINES		
Single Spindle Tapping	120	70
Multiple Spindle Tapping	14	
Pipe Threading and Cutting	56	14
Bolt Threading and Cutting	169	113
Thread Chasing	7	
Thread Hobbing and Milling	28	7
Thread Rolling	14	
Other	7	7
PLANERS		
Open Side	84	56
Double-Housing	190	120
SHAPERS		
Vertical	14	14
Horizontal	492	295
Slotters	28	7
KEYSEATING MACHINES	274	232
BROACHING MACHINES	120	21
GRINDING MACHINES		
Plain Cylindrical	436	267
Universal Cylindrical	98	70
Surface, Reciprocating	148	84
Surface, Rotating	35	7
Internal	113	28
Crankshaft	14	
Cutter	232	77
Floor, No Feed Attachments	556	246
Bench, No Feed Attachments	197	105
Abrasive Disk	281	113
Abrasive Belt	21	
Centerless	113	
Other	91	14
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	288	105
Abrasive Belt, Hand Operated	127	
Automatic and Semi-Automatic	7	
LAPPING MACHINES	28	14
HONING MACHINES	7	
CUTTING-OFF MACHINES		
Parting Tool Type	28	21
Power Hack Saw	450	162
Rotary Cold Saw	218	113
Bandsaw	141	63
Other	28	14
WIRE FORMING MACHINERY		
Spring Coiling		
Other	98	63
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt		
Resistance Welding, Spot	63	21
Resistance Welding, Seam		
Resistance Welding, Other		
Arc Welding	239	7
Electric Cutting	7	
Gas Welding	113	35
Gas Cutting	141	14
RIVETING MACHINES, STATIONARY		
Pneumatic	120	28
Hydraulic	436	345
Power	98	63
PRESSES		
Punching Machines	429	239
Combined Punches and Shears	211	63
Hand, Arbor	394	113
Hand, Light Punch Press Work	56	14
Foot, Light Punch Press Work	752	731
Power, Crank Type	1,259	928
Power, Toggle Type	7	
Power, Double Acting	7	
Power, Dieing Type	84	77
Power, Trimming Presses	14	
Power, Forcing, Arbor, Wheel	56	21
Hydraulic, Bending, Forming, Drawing	21	7
Hydraulic, Wheel Forcing, etc.	56	21
Baling, Power and Hydraulic	7	
Other	7	7
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	155	56
Bending Rolls, Horizontal	190	70
Bending Rolls, Vertical	14	14
Straightening Rolls	7	
Other	28	
SHEARS		
Knife	274	120
Rotary, Slitting	91	56
NIBBLING MACHINES	42	21
HAMMERS		
Drop	42	21
Helve	7	7
Spring	56	35
Steam	49	35
Pneumatic (not portable)	35	14
Other	21	7
FORGING MACHINES		
Bulldozers		
Hot Forging Machines	97	49
Cold Headers, Bolt, Nut, etc.	7	7
Cold, Swaging		
Forging and Flanging Presses, Hydraulic	7	
Other Forging Machines	14	
Total	22,433	11,505

IDEAS FROM PRACTICAL MEN

A Die That Was a Failure
Discussion

WE MAY not always profit by the experience of others, but at least we are interested in their mistakes. Most contributions to this department describe tools or shop methods that have been used to advantage. In Vol. 72, page 1036, Don A. Baker described a tool which was unsuccessful. In Vol 73, page 446, Charles Kugler showed what he believed to be a successful solution to the same problem. Since then so many comments have come in on this subject, that a number have been grouped together.

CHARLES H. WILLEY
Superintendent of Manufacturing,
Hoyt's Electrical Instrument Works

When one enters into the discussion of an article, it is best to preface any comments with a friendly word. For neither sarcasm nor destructive criticism help matters, and we are all likely to be wrong at times. After all, we are only citing in our personal experiences and ideas to show how we would perform certain jobs.

I have thought that if I were to plan the work described by Don A. Baker in an article under the title given above, I should attempt to make the piece from strip stock in one operation. I would make the die and the punch as shown in section in Fig. 1 and in perspective in Fig. 2, both members having double action. The strip stock would be fed along the guide far enough to cover the die. As the punch descended, the blanking would be done by the section *A*, this section being held down from the piercing punches and the shearing and bending punch by stiff springs. The die would be adjusted so it would not descend until sufficient pressure was delivered to blank the part.

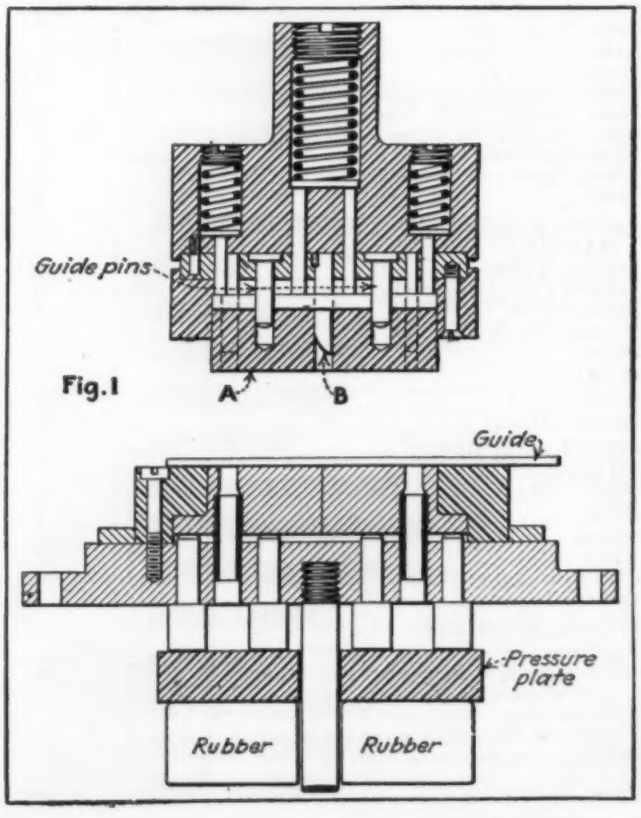


Fig. 1

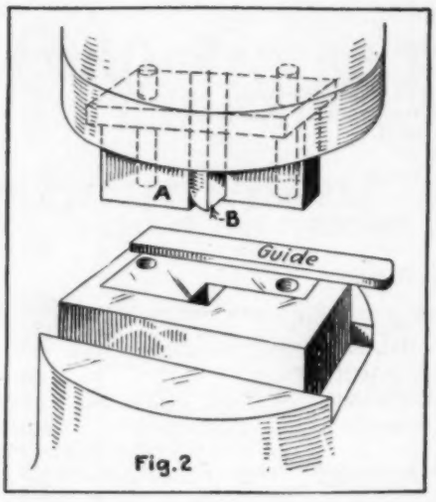


Fig. 2

When the die descended, it would come to rest on the die-base, and the punch, meeting stiff resistance, would move upward and allow the piercing punches and the shearing and bending punch to get in their work. The amount and the length of the bend would be governed by the amount sheared by the punch *B*, and would be determined by experiment.

RICHARD F. MOORE
Moore Special Tool Company

I was interested in the articles under the title given above, by Don A. Baker and Charles Kugler, because we have often run into similar problems. Mr. Baker is right in his statement that a good bend cannot be made where the length of the part bent is the same as the thickness of the stock.

In making right-angle bends, we always allow an additional length equal to about one-third the thickness of the stock, as that amount will be taken up in making the bend against a sharp corner. If Mr. Baker would add one-third, or in this case 0.020 in., to the part projecting from the die, which he will have to do to get the short leg to a length equal to the thickness of the stock, the punch will not pass the work without striking it.

In my estimation, the only way to make such a short bend is to add about one-third to the length of the part to be bent, and to cut down the clearance between the punch and the die to about 0.050 in. The result will be a rather unsightly lump, as shown in Fig. 3 at *A*, which in some cases might fill the bill. I do not believe that Mr. Kugler's die will do the work, though I have not tried it,

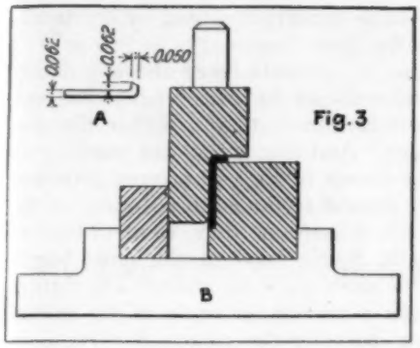


Fig. 3

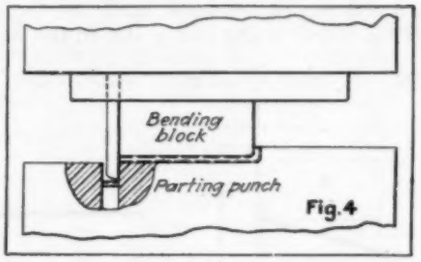


Fig. 4

because the spring pad and the pin will not hold the stock firmly enough. It must be understood that in making such a short bend, the pull of the stock along under the pad is very great.

At *B* is a die that is both cheaper to make and more positive than the ones shown by Mr. Baker and Mr. Kugler, but I doubt whether it will do the job satisfactorily. The work rests on a shelf and is held positively by the leading part of the punch.

WILLIAM BUTZLAFF

It is rather amusing to the writer to hear Mr. Baker and Mr. Kugler say that the part cannot be made in one handling in a progressive die. We make a similar part with a 1/16 in. right angle bend on 1/16 in. stock without any trouble as we roll feed the stock. The bend can be made if you make it around the other way as in Fig. 4. As we have produced several million pieces this way, I know it works.

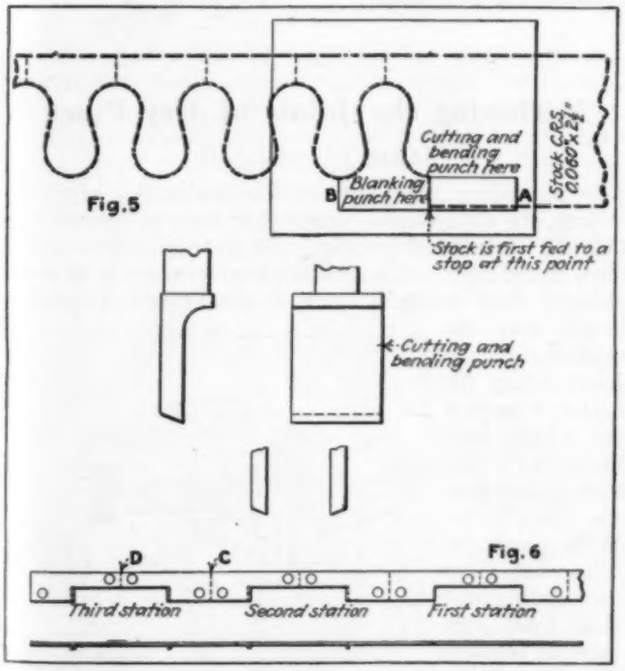


Fig. 5

Fig. 6

BERT F. WALLACE

At the time the article by Mr. Baker was published, I noted that it would call for a change in the first die due to the fact that the height of the bend is equal to the thickness of the stock. I believe Mr. Kugler, as well as the original designer of the die, has failed to consider this fact.

If the work were slit and the bend about ¼ in. long instead of 1/16 in., the die drawn by Mr. Kugler would be O. K. To illustrate the method I would follow on such a job, Fig. 5 shows how we made two brackets at one time, wasting no stock. We did this by matching a right end bracket with a left in such a way that one complete set of brackets was made at one stroke of the press.

The bracket die is a progressive die. The stock is first fed to a stop. The cutting and bending punch on the down stroke cuts and bends the metal at edge *A;* the next feed carries the stock to edge *B* which is, of course, the stop thereafter. The solid outline is the blanking die. The opposite pieces are bent and cut off further along, while a pressure pad holds the foot of the bracket. These dies were used for ten years continuously.

To apply this cut-off and bending die to this job of Mr. Baker's, I believe two pieces at a time would help (one punch opposes the other). At the first station (Fig. 6), pierce the holes and block out all but ⅛ in. of metal; at the second station, have two punches as shown; then a cut-off at *C* and *D*.

GEORGE BELBES
Teletype Corporation

Mr. Kugler's design is too complicated, and it will cost much more than the character of the piece would warrant. A die made as shown in accompanying sketch, Fig. 7, is very simple, and I am sure Mr. Baker will get as good results as with any other type of design.

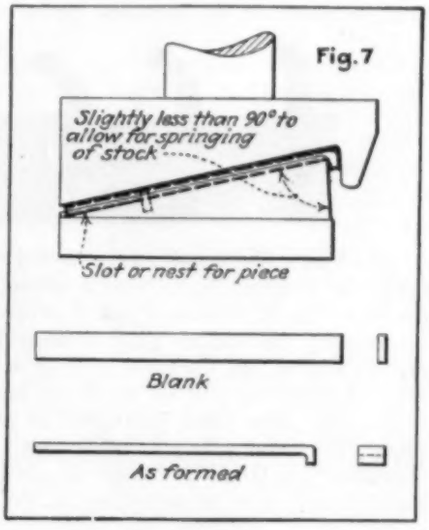


Fig. 7

GEORGE D. TAYLOR

In looking at Mr. Kugler's sketch it is quite apparent that the location of the inner corner of the bending block is at a point only one-quarter the thickness of the blank from the top. Therefore, the angle of the block will strike the upper corner of the blank, crushing it, and the end of the block will strike the crushed part of the blank and upset it. Not only is the block required to make the bend, but it is also used to shear the part to be bent from the side of the blank.

To satisfy myself, and others who have to be shown, I made the fixture *A*, Fig. 8, to make a bend, not exactly

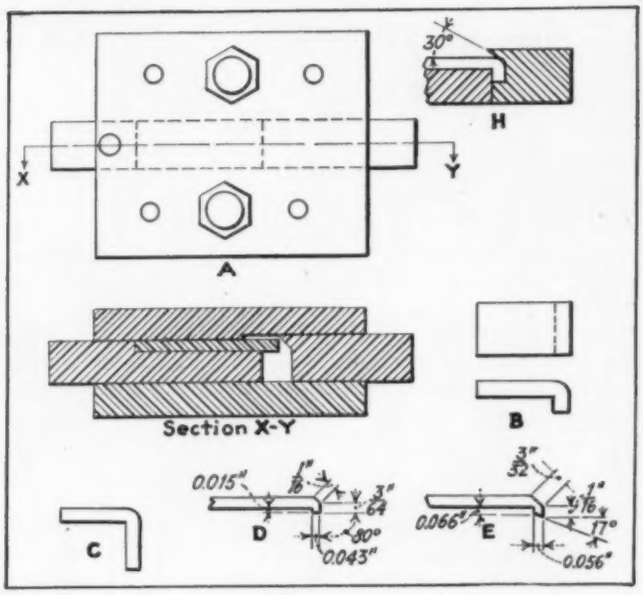


Fig. 8

like the one shown by Mr. Baker, but across the whole end of the blank, as shown at *B*. To determine the best location for the inner corner of the bending block, I bent a piece of $\frac{1}{16}$-in. stock to a right angle in a bending brake. The result *C* showed me how a good bend should look. The round on the outside starts on a line with the inside corner. This condition indicates that the inner corner of the bending block should be on a line with the bottom of the blank, see section *X-Y* of the fixture.

As the bends made in the fixture were small and not easy to illustrate by sketches, seven of the best were

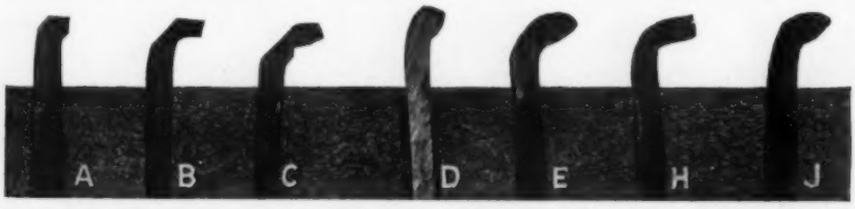


Fig. 9

mounted on a block and photographed on a scale of three times the original size. These photographs are reproduced in Fig. 9. Pieces *A* and *B* projected $\frac{1}{16}$ and $\frac{3}{32}$ in., respectively, the shapes after bending being shown at *D* and *E*, Fig. 8. In the piece *C*, Fig. 9, the bent part was sheared from the side of the blank and projected $\frac{3}{32}$ in. in the die. The blank was held in place by two $\frac{3}{16}$-in. pins. The bend was $\frac{1}{2}$ in. wide and projected 0.096 in. downward, or 0.033 in. longer than was wanted. Shearing did not seem to affect the shape at the bend very much.

While making the bends, it occurred to me to change the shape of the bending block to that shown in the section at *H*, Fig. 8. Trial piece *D*, Fig. 9, was $\frac{1}{2}$ in. wide and projected $\frac{3}{32}$ in. The piece at *E* projected 0.150 in. the one at *H* projected $\frac{1}{16}$ in. and was held in place by $\frac{3}{16}$-in. pins. The sample at *J* projected $\frac{1}{32}$ in. and was likewise held by $\frac{3}{16}$-in. pins. The samples *A*, *B*, and *C* were bent by the block shown in section *X-Y*, while the others were bent by the block shown at *H*, Fig. 8. As the ends of the blanks were distorted by bending, I was anxious to know just what became of the material. I coppered and center punched the ends of samples *C* and *H* before bending. After bending, the holes in pieces *C*, *H* and *J* showed some distortion caused by the bending pressure against the pins.

As the result of the experiments noted above, it is my opinion that the device shown by Mr. Kugler will not make a bend that will be satisfactory to either the diemaker or the customer. And that is the acid test.

While the fixtures shown in Fig. 10 are not intended to be included in my answer to the editorial query at the foot of Mr. Kugler's discussion, they were drawn to show diagrammatically how a bend of the same length as the thickness of the stock could be made. The fixture at *A* shows the blank placed at an angle in the pocket preparatory to being bent by the punch *B*. At *C* is shown the completed bend made by the notched punch. At *D* the blank is put into a slot in the fixture, the lower

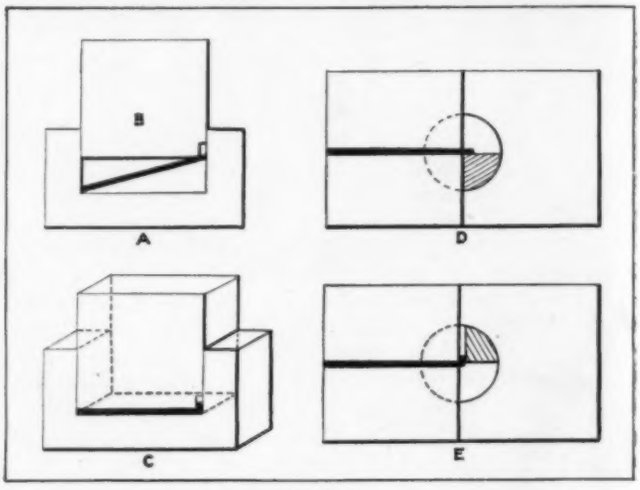


Fig. 10

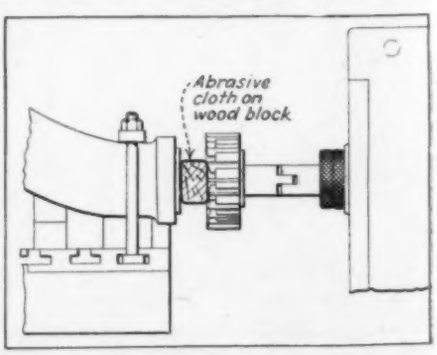
surface of the end to be bent resting against one of the surfaces of a pie-shaped extension on the end of a rotatable bar. Rotating the bar 90 deg., as at *E*, will make a bend.

■

Machining the Joints of Dry Pipes

JAMES J. THOMPSON

In machining the joints of locomotive dry pipes by milling, the cutter leaves marks that must be removed so that but little hand grinding will be required to make them steam tight. After milling, our practice is to wrap abrasive cloth around a block of wood that is somewhat longer than the diameter of the joint, bring the cutter against the block until the teeth bite into it, and start the machine. With plenty of lubricating oil on the cloth, little time and pressure are required



to grind out the cutter marks, leaving the joint smooth for the little amount of hand grinding necessary.

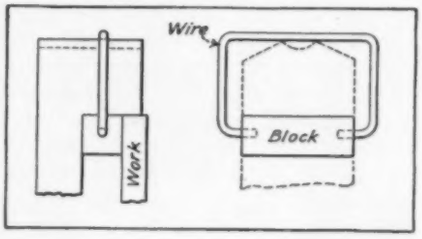
One of the advantages of this method is that the face of the joint so ground will be parallel to the surface left by milling. The saving in time over grinding out the cutter marks by hand is very considerable. The illustration shows the scheme.

■

Holding Thin Work in the Lathe Chuck

RICHARD H. KIDDLE

Where work that is thinner than the depth of the steps in the chuck jaws is to be held in the chuck, it cannot be faced without blocking it out from the faces of the jaws. Since such blocking is hard to keep in place, especially when placing the work, or in truing it by alternately adjusting the jaws, I use the following method:



Shallow holes are drilled in the ends of the blocks, and the ends of wires are bent and put into them, much in the same manner as bails are attached to the ears of cheap pails. The loops of the wires are then passed over the tops of the jaws, retaining the blocks in position, as shown in the illustration. When but a single piece is to be chucked and no such wired blocks are at hand, hard grease or heavy oil can be used to stick the blocks to the jaws.

■

Fixture for Machining Two-Jaw Clutches

W. L. RAMSEY
Manchester, England

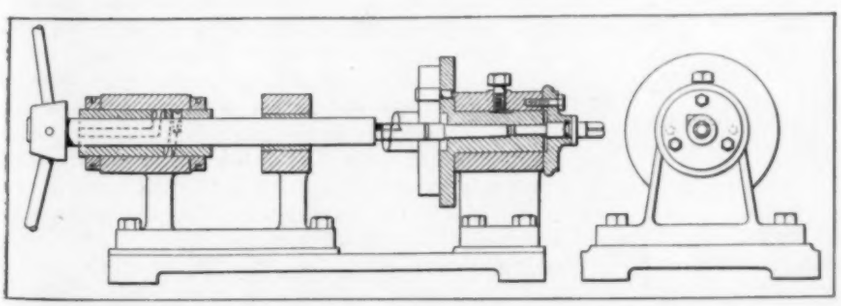
Having a large quantity of two-jaw clutches to make, we built the hand-operated machine shown in the illustration for machining the helical parts between the jaws. The clutch blanks were bored and faced in the lathe, and the faces of the jaws were machined by two simple milling cuts, using a cutter $\frac{1}{8}$ in. in width.

The fixture has three standards mounted on a base, each standard having a bearing at the top. The standard at the right carries a spindle and a faceplate, on the latter of which the clutch members are mounted by their flanges. This spindle does not revolve, but can be moved endwise by the feed screw at the extreme right, the operation being the same as that of the tailstock spindle of a lathe.

The standard at the left carries a spindle to which the cutter is attached. At the extreme left is a pilot wheel by which the spindle can be revolved. The standard in the center carries an outboard bearing to support the spindle while the cut is being taken. Fixed in the bearing of the left hand standard is a bushing having helical and axial grooves cut through its wall, and acting as a master cam. A pin in the spindle engages these grooves, thereby giving the spindle axial motion as it is revolved. The axial slots are to permit the cutter to be withdrawn after it has reached the low points between the clutch jaws, and so to begin its cut at the high points.

In operation, the cutter spindle is revolved by the pilot wheel at the left, and is given axial motion by the pin engaging the master cam. The work is fed to the cutter by advancing the work-carrying spindle by means of the feed screw at the extreme right. The cut is commenced at the high part of one jaw, and cuts the helix to the face of the next jaw. At the end of the cut, the cutter is withdrawn as far as the high point of the second jaw, and the cut is then started, cutting the helix to the face of the first jaw.

The helical parts of the clutch members were formerly finished by hand, the time being two hours per pair. This time has been reduced to two minutes by the use of the fixture.



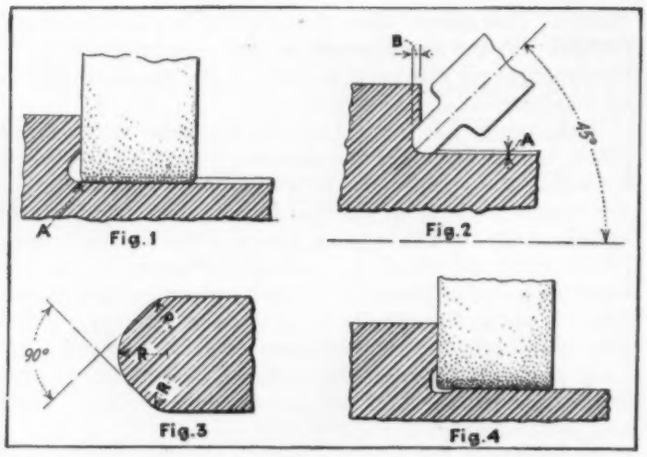
■

Necking for Grinding—*Discussion*

F. A. FIRNHABER

In an article under the title given above, on page 713, Vol. 73, of the *American Machinist*, J. T. Towlson says that in necking milling machine arbors for grinding, the necking should be done in the shoulder, rather than in the part on which the cutter is held. One objection to Mr. Towlson's statement is illustrated by Fig. 1. A grinding wheel will not retain its sharp corner while cutting, therefore a small fillet will be left at *A*, of the same depth as that of the cut. Since the shoulder is ground last, the fillet will be somewhat longer when grinding the straight part only.

In grinding the shoulder to the neck recess, the wheel will touch the straight part of the arbor in removing the fillet, with a possibility of reducing the diameter somewhat. The fillet can be removed from a soft arbor after grinding by the use of a turning tool, while on a hardened arbor, a saucer-shaped wheel must be resorted to, if at all possible. Either of these methods necessitates another set-up, which in production would not be the best policy. As to the weakening of the arbor by necking the straight portion, a 1-in. arbor, for example, having a depth of neck of 0.008 in. per side in the straight part after grinding, will be reduced in area at that point but three per cent, which may be considered as negligible. In larger arbors the percentage will be less.



A method of necking that is in successful use is illustrated in Fig. 2. The depth of the neck *A* is one-half that of the recess *B* in the shoulder, before grinding. For example, in a 1-in, arbor having an allowance of 0.015 in. for the grinding, the neck would be $\frac{1}{64}$ in. deep per side, the shoulder recess being $\frac{1}{32}$ in. deep, before grinding. The tool should be well rounded, as shown enlarged in Fig. 3, to prevent fracture in the corner. It should be fed into the work at an angle of 45 deg. to the axis of the arbor.

In Fig. 4 is shown how this method of necking permits a grinding wheel having rounded corners to grind to the shoulder without leaving a fillet.

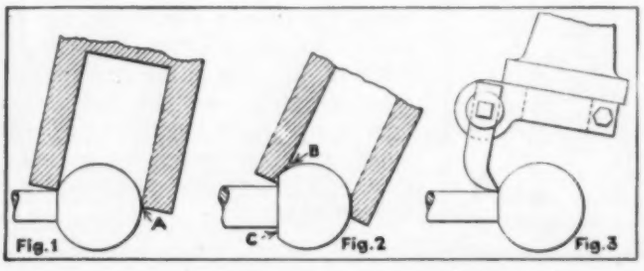
■

Concavities and Convexities—*Discussion*

C. A. Coppack
Leicester, England

Under the title given above, on page 488, Vol. 73, of the *American Machinist*, John T. McHenry describes a method of turning spherical surfaces, about which I would like to say a few words. We have used hollow mills and lapping tools for years in the making balls. The objection to the process, however, is the difficulty of setting the point *A*, Fig. 1, exactly in the axis of the work. If the cutter is to cover a range of work, it must have a sharp corner and the teeth must be cleared to cut on the inside. For repetition work, the cutter may be formed as in Fig. 2, where the flats on the inner edge are at such an angle as to be tangent to the surface of the sphere to be produced. This method can, of course, be used only where a shoulder, as at *C*, can be left on the work.

Alternately, a single-point tool held in a suitable holder, as in Fig. 3, so that it will revolve in a circular path, will save the cost of the hollow mill.



SEEN AND HEARD

●

Double Check

AGREEMENT or disagreement with our editorials is expected, but regularly we receive unusual reactions. The latest is in regard to the editorial, "Back to the Simple Life" in *American Machinist* on page 1016, Vol. 73. We presumed to suggest that many tool builders were missing a sales opportunity in not meeting the demand for "light-duty versatile equipment, capable of handling a general range of work, yet available at a modest price." We further cited two specific examples of tool builders who had recognized and prepared for this market, one of which did a business of 5,600 units last year, aggregating something over two million dollars. Well, by the first mail after that issue reached the Southland, came a letter, saying: "We have read with interest . . . . . The trade in our territory is particularly in need of light-duty equipment as mentioned by you. We would like to know the names of the two manufacturers referred to by you, as we are interested in acting as distributors for such manufacturers." —*T.*

Is this a Record?

WHETHER shown by a horse or an airplane or a machine tool, speed will always get me. I have just come from seeing 11⅞-in. diam. forgings, clean as a whistle, turned with a Carboloy tool in a new Barnes automatic lathe at 340 in. with a feed of 0.028 in. These particular forgings were made of steel containing 4 per cent nickel and 1½ per cent chromium, annealed tensile strength over 100,000 lbs.—Is this a record? —*X.*

Involute Teeth—Modified and Plain

YEARS AGO many experts argued over gear tooth forms with great gusto. Advocates of the involute system put it all over those who espoused the epicycloidal form. But it wasn't exactly a clean-cut victory, because modifications of the involute form were found to be necessary to secure just the kind of tooth action they wanted. Nothing stands still in modern mechanics, and the other day I found an engineer who says the modification isn't at all necessary. He is in fact generating teeth on the true involute and says they put it all over the modified tooth form.

Another engineer is all steamed up over the hobbing game and sees the disappearance of all the other methods as soon as we all wake up to see what's what. All of which reminds me of one of our early gear experts, George B. Grant, who did a lot to spread gear knowledge in the long ago. Early in the game he devised the hobbing method and was the first to bring it to my attention. He seemed, however, to consider it a "stunt" and did not realize its possibilities as indicated by his writings in *American Machinist* in his later years.

But it is pretty safe to say that we shall use several kinds of gear cutting machines for a long time. —*J.R.G.*

Standard Tolerances and Allowances for Locomotive Repairs—I

STANDARD data sheets, giving allowances and tolerances for fits and indicating the limits at which repairs or renewals must be made, are used by progressive railroad systems. A series of these sheets, suitable for use by any railroad shop, will be reproduced from time to time in these pages. Their publication has been permitted by a major railroad system.

ALLOWANCES FOR DIFFERENT KINDS OF FITS

In all work requiring a fit, either force, driving, push, or running, the diameter of the hole shall conform to the dimension given on the tracing within the limits herein given, while the diameter of the bolt, pin, or shaft which goes into the hole shall be of such dimensions that it will fit in the hole as here indicated for the different classes of work.

Where allowances for fits are given on tracings or in other Maintenance Instructions, the allowances there specified shall govern the allowances for those fits only.

The allowances for different fits and for tolerances of holes as given in the following table shall be used, unless otherwise specified on tracings or in other Maintenance Instructions. Where other Maintenance Instructions Circulars or tracings are referred to, the last issue is intended. This table gives allowances covering average conditions.

Nominal Diameter	Limits	Tolerances for Standard Holes	Allowances for Different Kinds of Fits			
			Running Fit	Push Fit	Driving Fit	Force Fit
Up to ½"	High	+ .0005	— .0010	— .0003	+ .0005	+ .0010
	Low	— .0005	— .0020	— .0008	+ .0003	+ .0005
½" to 1"	High	+ .0010	— .0015	— .0003	+ .0010	+ .0020
	Low	— .0005	— .0030	— .0008	+ .0008	+ .0015
1" to 2"	High	+ .0010	— .0020	— .0003	+ .0015	+ .0040
	Low	— .0005	— .0040	— .0008	+ .0010	+ .0030
2" to 3"	High	+ .0015	— .0025	— .0005	+ .0025	+ .0060
	Low	— .0010	— .0045	— .0010	+ .0015	+ .0045
3" to 4"	High	+ .0015	— .0030	— .0005	+ .0030	+ .0080
	Low	— .0010	— .0050	— .0010	+ .0020	+ .0060
4" to 5"	High	+ .0020	— .0035	— .0005	+ .0035	+ .0100
	Low	— .0010	— .0060	— .0010	+ .0025	+ .0080
5" to 6"	High	+ .0020	— .0040	— .0005	+ .0040	+ .0120
	Low	— .0010	— .0070	— .0010	+ .0030	+ .0100
6" to 8"	High	+ .0020	— .0045	— .0005	+ .0045	+ .0140
	Low	— .0010	— .0080	— .0015	+ .0035	+ .0120

For all work in which a force, driving, push, or running fit is not required, the size of bolt or sha shall control and the diameter shall be an even dimension within certain limits, governed by shop practic

For **machine-turned** bolts in drilled holes, the hole shall be $\frac{1}{64}$" larger than the nominal size the bolt.

For **rough-turned** bolts in drilled holes, the hole shall be $\frac{1}{32}$" larger than the nominal size of t bolt.

Cored holes shall be $\frac{1}{16}$" larger than the nominal size of the bolt.

Punched holes shall be either $\frac{1}{32}$" or $\frac{1}{16}$" larger than the bolt or rivet, according to whet it is a small or large hole and based on the thickness of the material.

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American Machinist

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Locomotive Obsolescence

SO MUCH has been printed in *American Machinist* on the obsolescence of shop equipment that some readers may have come to believe that no other type of equipment is subject to the same disease. But the contrary is true. American metal-working plants owe their very existence to a replacement policy that, inadequate as it is in many places, is better than the policy current in competing plants elsewhere, and they also compare favorably with other enterprises.

Look for a moment at the railroad locomotive figures quoted in the National City Bank (of New York) survey for December. The weighted average rate of depreciation on locomotives charged by all railroads in 1928 was 3.2 per cent. One road charged but 1 per cent, and only twelve charged over 4 per cent. Repair charges per year, in 1926, 1927, and 1928, averaged $435,000,000 as against depreciation and retirement charges of about $60,000,000—about seven to one. Is it any wonder that only one-fifth of the locomotives are less than ten years old?

Attempts to place the blame for this situation are rather footless. Needless to say, it does not lie at the door of any single unit, or group, or department. Remedies are more to the point. One that has recently been put forward contemplates a deferred payment plan that amounts to a lease of the locomotive for fifteen years, at the end of which time the railroad takes title.

Whether this plan can be made to work remains to be seen. If it can, the next step might be a plan by which locomotives would be leased to the railroads on a basis partially comparable to that on which Pullman cars are handled. In that case railroad back shops would disappear, nd be replaced by the few big manufacturing and naintenance plants of the company owning the ocomotives, while running repairs would be made roundhouse shops. And how important to the ilders of railroad tools such a development ould be!

More Technique Needed

WHEN we shall have applied the same sort of technique to management and merchandising that we have applied to production we may expect to hear no more of the complaints against the engineer for causing technological unemployment. This is the confident opinion of Elliott D. Smith, of Yale University, who has made a careful study of the situation.

Professor Smith proves his contention by quoting the experience of two textile mills. One of them adopted modern production methods and the most up-to-date equipment, but at the same time took care to develop markets for the increased production, to make the change so gradually that no employees were thrown out of work, to improve the sanitary conditions in the mill and the surroundings of the mill village. That mill has a waiting list of operatives anxious to be on its payroll, and its balance sheet is impressive.

A similar mill put in the modern equipment, and stopped right there. No market was developed, sanitary conditions remained anything but sanitary, the mill village was the type of mill village that no one wants to live in. The operatives have been on strike for months, and the balance sheet is depressing.

Both mills started by applying good technique to the production side. One carried through, the other did not. Unfortunately, we have more examples of the latter practice than of the former, and we naturally have technological unemployment because insufficient technique has been applied to the business as a whole.

High Wages, Low Costs

Figures are being circulated in Europe which seem to astound Europeans. Stripped to their essentials the figures prove that the Copenhagen plant of an American automobile manufacturer pays the highest wages and produces the lowest unit costs for him; his Antwerp plant pays the lowest wages and shows the highest unit costs.

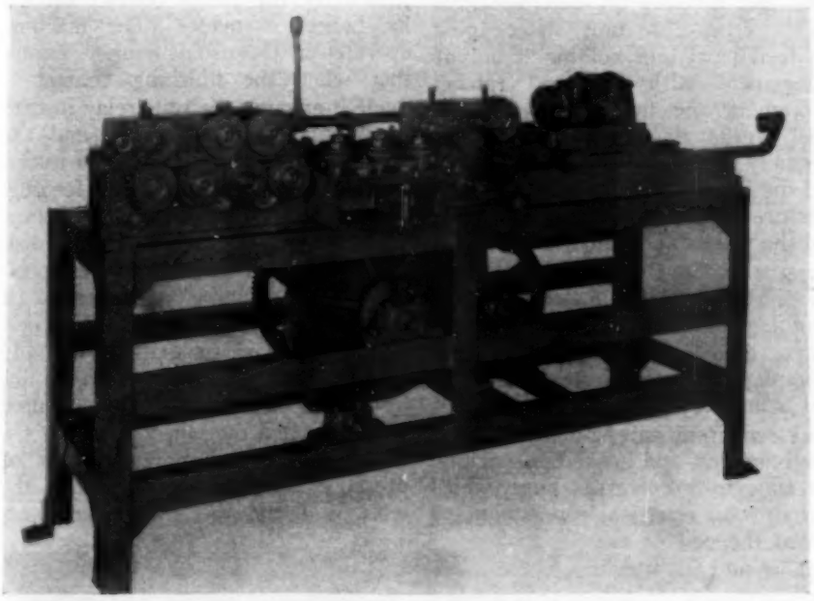
It is recommended that these facts be explained in words of one syllable to certain economists and bankers. Too many of them are recommending wage-cuts; too few have sufficient manufacturing experience to know that high wages are the very foundation of low manufacturing costs.

SHOP EQUIPMENT NEWS

Artos Automatic Straightening, Measuring and Cutting-Off Machine for Copper Tubing

Requirements of manufacturers of refrigerators, unit heaters, and radiators have prompted the design of an automatic straightening and cutting-off machine for copper tubing by the Artos Engineering Company, 119 Brown St., Milwaukee, Wis. In the process of manufacture of these units, the copper tubing must be straightened and cut to predetermined lengths. The type TC machine takes the end of a coil of tubing in the feeding rollers, and the entire operation of feeding, straightening, measuring and cutting is automatic. The feeding speed is about 50 per min., but the actual production is dependent on the length of pieces to be cut. For example, for 12-in. lengths the production is approximately 22 pieces per min., and for 24-in. lengths it is about 15 pieces per min. The machine is easily adjustable for any cutting length up to and including 6 ft., but if desired, the machine can be built for any cutting length within commercial requirements.

An attachment can be provided whereby the first end of the coil of tubing is trimmed off automatically before the first piece is cut to length. The machine is also suitable for handling copper tubing such as employed for gasoline and oil feed pipes in automobiles.



Artos Automatic Straightening, Measuring, and Cutting-Off Machine for copper tubing, being furnished with a main driving motor and an individual motor-driven circular saw

Greenfield No. 4-R Reamer Grinder

A motor-driven unit for reamer grinding has been placed on the market by the Greenfield Tap & Die Corporation, Greenfield, Mass., in the form of the No. 4-R. This machine can be adapted by use of attachments to perform the operations of a universal cutter and reamer grinder, including cylindrical and internal

grinding. Wheel-spindle drive is by means of an inclosed motor, mounted integrally with the grinding spindle. The wheelhead swivels to any desired angle with the table, and is provided with graduations. The longitudinal slide is provided with flat and V-ways. Longitudinal motion is by means of a large handwheel through rack and pinion. Adjustable stops or dogs are provided for limiting the stroke of the slide for shoulder work.

The work table has a vertical movement in addition to a horizontal movement. It is provided with a screw adjustment for swiveling for taper work and is graduated from the right-hand end, each graduation representing a taper of $\frac{1}{8}$ in. per ft.

The machine is suitable for grinding both straight-flute and spiral-flute reamers. In the first case, the tooth rest may be set anywhere along the flute under the cutting edge, but preferably near the front end, whereas for spiral-flute reamers it is necessary that the tooth rest be set directly under the point where the grinding wheel comes in contact with the cutting edge.

Specifications: distance between centers, 21 in.; swing over table, $6\frac{1}{4}$ in.; length of table travel, 19 in.; cross feed, 6 in.; vertical feed, 8 in.; distance from center of wheel spindle to table at lowest position, $8\frac{1}{4}$ in.; floor space, 47x39 in., and net weight, 475 lb.

Sparking-Out Attachments for Heald Internal Grinders

Sparking-out attachments for use with the No. 72A Size-Matic internal and the No. 72A Gage-Matic internal grinders have been developed by The Heald Machine Company, Worcester, Mass. On high precision internal grinding jobs requiring fine finish, after the feed of the machine has been discontinued a certain period of time is required for the wheel to spark out. This sparking out is the

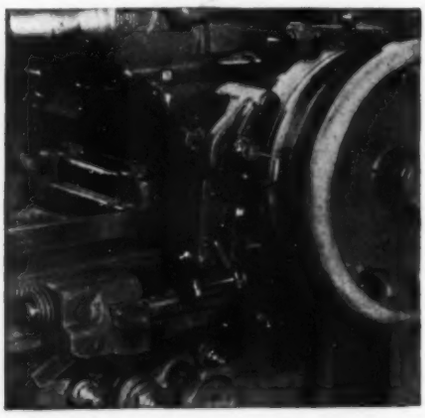


Fig. 1—The feed pawl on the Heald Gage-Matic Internal Grinder is disengaged during the sparking-out time by means of a magnet placed on the other side of the cross-slide handwheel

natural dying out of a transverse pressure that is built up between the wheel and the work by the in-feeding function, and it takes the form of a very minute spindle deflection. By taking advantage of this condition the company has developed these attachments.

By automatically interrupting the cross feed and allowing sufficient time for the pressure present in the spindle to dissipate itself naturally, as the wheel is reciprocated in the bore of the piece being ground, these attachments aid in producing accurate and finely finished holes.

On the Gage-Matic, the hole is rough ground in the usual manner, the roughing gage attempting to enter the hole after each pass of the wheel, until the gage does enter and causes the wheel to be withdrawn for dressing. The gage is of such size that after the work has been rough ground and the wheel has been trued, there is just enough stock left in the bore so that it will be removed by the pressure in the spindle when it is returned to the bore. The wheel, because of this pressure, then cuts itself free, bringing the hole to size and allowing the finish gage to enter, which in turn causes the machine to go to the rest position.

When the roughing gage enters, besides causing the wheel to withdraw for dressing, an electrical contact is made that actuates an electro-magnet on the cross-slide unit, disengaging the feed pawl and holding it out of engagement with the feed ratchet throughout the finishing cycle. In other words, the cross feed is automatically disengaged after roughing, and the hole is brought to size by the pressure remaining between the wheel and the work. The time required for the sparking out is governed by the amount of stock left in the hole after roughing and the adjustment of the truing diamond. Inasmuch as the roughing gage constitutes a definite and constant limit, the amount of stock remaining can be held to a very small amount, and hence the sparking out time to a correspondingly short period. An electrical connection between the coil of the magnet and the toggle switch on the control box of the machine serves to keep the magnet operative, and hence the feed pawl disengaged, until the finishing passes of the wheel have been completed and the table run out to rest position.

Truing the Wheel

A micrometer diamond unit is employed, and it is important to note that the position of the diamond governs the finish obtainable. Moving the diamond inward trues more material off the wheel, hence the wheel goes back into the hole with a lighter pressure, and takes a larger number of passes to bring the hole to finished size. This gives improved finish, of course, but reduces production. The converse is equally true; that is, moving the diamond outward increases the production and gives a less perfect finish. Thus, the operator has a wide range of finishes available.

Size-Matic Attachment

The sparking-out attachment for the Size-Matic consists of a time relay mounted on the machine to regulate the sparking-out time, and a cam attached to the top of the fine feed cam on the handwheel to stop the feed just after the finish contact on the handwheel is made. The machine operates in the usual manner, except that when the finishing contact is made it engages the time relay instead of tripping the table dog, and the grinding wheel continuous to reciprocate in the work without feeding. After a predetermined length of time, the time relay trips the table dog, which runs out the table to rest position. The principle of operation of the Size-Matic device is that the wheel is always trued so that its working face is a certain distance from the finished size of the part being ground. That is, when the wheel re-enters the work after dressing, the amount of pressure between the wheel and the work is always the same within nar-

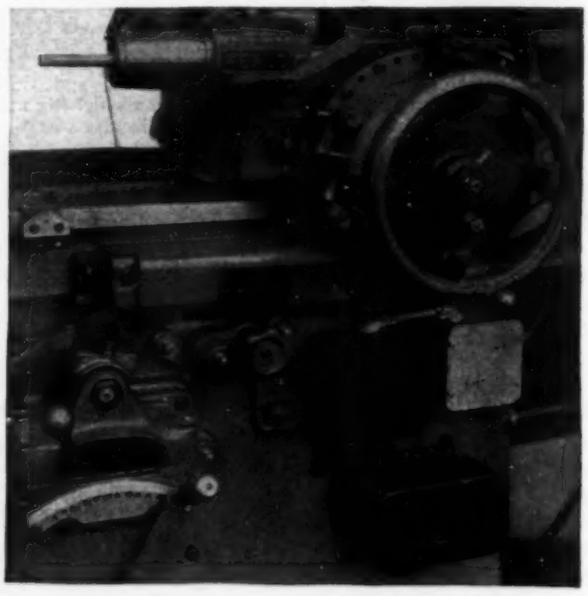


Fig. 2—A cam attached to the fine feed cam on the handwheel stops the feed just after the finish contact is made on the sparking-out attachment for the Heald Size-Matic Internal Grinder, and the number of reciprocations is governed by a time relay

row limits. This allows a uniform amount of stock to be removed in a given period of time after the feed is stopped.

To vary the finish obtainable with this arrangement, it is necessary to adjust both the diamond and the time relay. To improve the finish, the diamond must be moved inward, and at the same time, in order for this not to effect the size, the interval of the time relay must be increased. In other words, the diamond has precisely the same effect on finish as on the Gage-Matic with sparking-out attachment. On the Size-Matic machine, however, the diamond also governs the finished size of the piece. In order to prevent the size from becoming smaller as the diamond is moved inward, it is necessary that the interval of the time relay be increased to allow a greater length of time for sparking out. This increases the number of finishing passes, and compensates for the alteration in the diamond setting. With opposite adjustments, the opposite effect is produced.

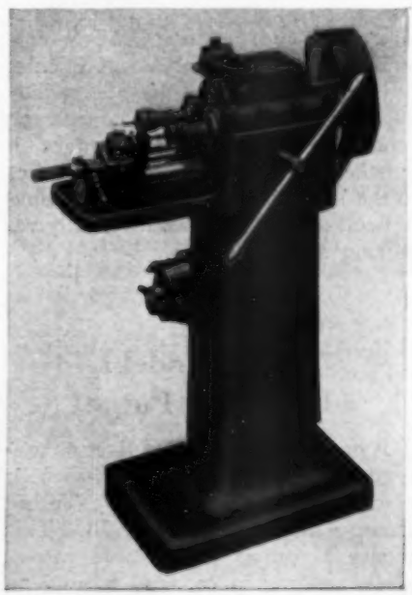
For extremely fussy jobs on the Gage-Matic, where production is disregarded and maximum finish is required, it is desirable to add a time relay similar to that used on the Size-Matic and a backing off attachment to lift the wheel from the ground surface before withdrawal. On the Size-Matic, for similar work, the backing off attachment is also desirable.

"Mum" Two-Spindle, Horizontal Drilling and Tapping Machine

Both drilling and tapping operations can be performed in a single set-up on the "Mum" two-spindle horizontal drilling and tapping machine announced by the United Machine Tool Corporation, 75 West St., New York, N. Y. Simple clamping of the work only is required. The machine is manufactured in two types, HBG-1 and HBG-2, the former having a work holder that rotates on a short stub arbor to present the hole to the drill and the tap successively, whereas the type HBG-2 is provided with a T-slotted table, upon which a swinging work holder may be mounted. The first machine has capacity up to $\frac{5}{16}$ in. in steel, whereas the second has capacity up to $\frac{5}{8}$ in.

The frame provides bearings for the two spindles, which are round and run in ball or phosphor-bronze bearings. Reverse motion of the tapping spindle is obtained by means of an elastic coupling. Spindle speeds on the model HBG-2 are so arranged that three speeds each are imparted to the drilling and tapping spindle, that is 400, 600 and 866 r.p.m. for the drilling spindle, and 134, 200, and 290 r.p.m. for the tapping spindle. The model HBG-1 can be had either in a high-speed machine for handling parts made of aluminum or other light metals, or for operating in steel, cast-iron, and brass. It can be had with belt or motor drive.

The tools are held in suitable chucks provided with Morse taper shanks. The work table of the larger machine is provided with T-slots for carrying the swinging work holder or for accommodating heavier work pieces. Longitudinal traverse is by means of a large star handle carrying a pinion and engaging in a rack connected to the table or work-holder base. Longitudinal traverse is adjustable by a stop.



"MUM" Model HBG-1 Two-Spindle, Horizontal Drilling and Tapping Machine

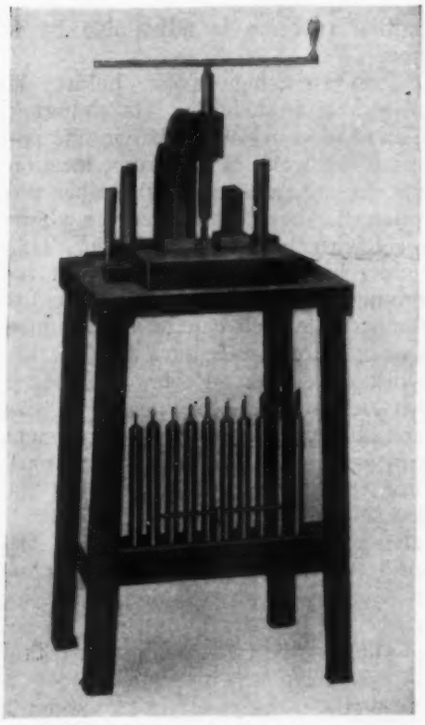
The swinging work holder is adjustable in height. Its swinging motion is so arranged that in one position the work is in correct location for drilling, whereas in the other position the bore is in accurate alignment with the tamping spindle. This holder has a cylindrical bore for receiving the simple locating plate for the work, which can be so designed that it is only necessary to slide the work piece over an arbor or place it between stops, according to its size and shape. The swinging movement can be limited by adjustable stops. For the purpose of simplifying the locating plate, a twist drill pilot is clamped on the table, guiding the drill by means of interchangeable bushings. Because of the definite location of the work and the secure guiding of the twist drill, no marking or centering of the work piece is required, thus making savings in equipment and labor.

Additional specifications of the model HBG-1: distance between centers of spindles, $4\frac{3}{4}$ in.; longitudinal traverse of work holder, 7 in.; maximum distance from top of swinging work holder to center of spindles, $1\frac{3}{8}$ in.; minimum distance, $\frac{1}{2}$ in.; vertical adjustment of work holder, $\frac{7}{8}$ in.; floor space, 1 ft. 7 in. by 2 ft. 4 in.; and net weight, 370 lb.

Additional specifications for model HBG-2: distance from top of table to center of spindles, $7\frac{7}{8}$ in.; distance from center to center of spindles, $4\frac{3}{4}$ in.; longitudinal traverse of work holder, 14 in.; maximum distance from top of swinging work holder to center of spindle, $1\frac{7}{8}$ in.; minimum distance, $1\frac{1}{4}$ in.; vertical adjustment of work holder, $\frac{5}{8}$ in.; floor space required, 3 ft. 4 in. by 2 ft. 2 in.; net weight, 930 lb.

"Bay State" Hand Tapper

A hand tapping bench for tool and die rooms has been placed on the market by the Bay State Tool & Machine Company, 412 Albany St., off St. James Ave., Springfield, Mass. This equipment is said to cut direct hand-tapping labor costs 75 per cent and makes quick, accurate tapping easy. Tapped holes are assured at right angles to the work without the aid of a square. It does away with



tap extensions, since the spindle itself reaches down between projections in the work.

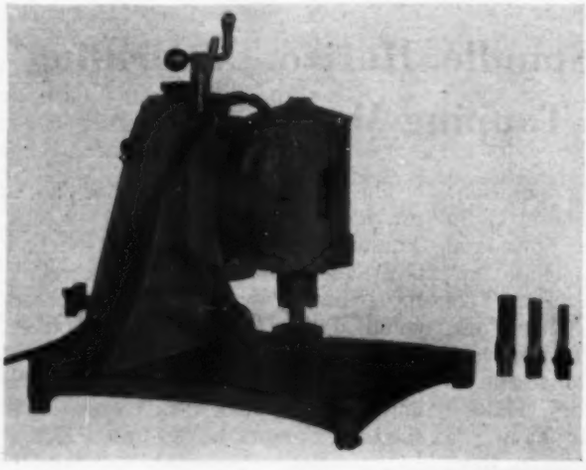
This hand tapper requires no setting up. It is not necessary even to change taps. The rack holds spindles enough with various size taps for every job. After the work is placed on top of the table against the stop, a spindle with the proper tap is inserted in the bracket sleeve. The tap is held firmly by a tapered, split collet in a hardened and ground spindle.

"Grindrite, Jr." Die Grinder

Four interchangeable grinding wheels can be used on the "Grindrite Jr." tool or die room grinder announced by the Koestlin Tool & Die Corporation, 3601 Humbolt, Cor. Magnolia, Detroit, Mich. This grinder is equipped with a ½-hp. vertical grinding head having a maximum speed of 12,500 r.p.m. under no load and a full load speed of 7,500 r.p.m. with the largest grinding wheel. The bench space required is 14x18½ in., the height over-all is 20 in. and the weight is approximately 125 lb.

The grinding head is operated on a pivot, about which it may be swung 5 deg. in either direction to grind the required clearance in dies. A graduated scale facilitates accurate angle settings. A diamond dresser may be advanced by means of a hand screw for resurfacing grinding wheels. In setting the machine up for a job, a vertical adjustment of the grinding wheel is accomplished by turning the handle, which may then be locked by a setscrew.

In performing internal grinding operations, it is often desirable to lift the wheel clear of the work for inspection. This is done by a quick toggle action device operated by means of a lever. In grinding short or long pieces of work, with one of the smaller size wheels, it is often preferable to have the wheel close to the front of the opening in the machine table. By loosening four screws, the column and grinding head

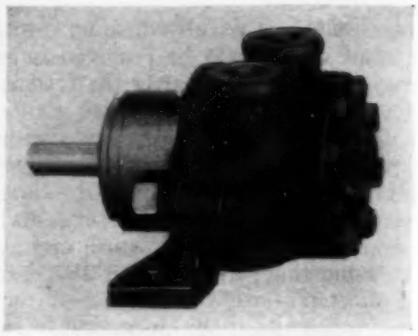


can be moved forward or backward into the desired position, and the column can then be reclamped quickly.

The machine can be used for grinding any contour, either convex or concave; for grinding raised edges on punches; for grinding out small dies to the line or templet, or for grinding difficult and odd shapes ordinarily requiring special set-ups.

Tuthill Model L Hydraulic Pump

A gear-type, positive-delivery pump featuring a mechanical seal has been placed on the market by the Tuthill Pump Company, Chicago, Ill. This model L pump is available in six sizes, ranging in capacity from 3 to 180 g.p.h. Motor speeds up to 3,600 r.p.m. are taken care of in the smaller sizes and up to 1,800 r.p.m. in the larger sizes. Pressures up to 200 lb. per sq.in. can be developed in the larger pumps. These pumps may be mounted above the level of liquid because they have a high suction lift.



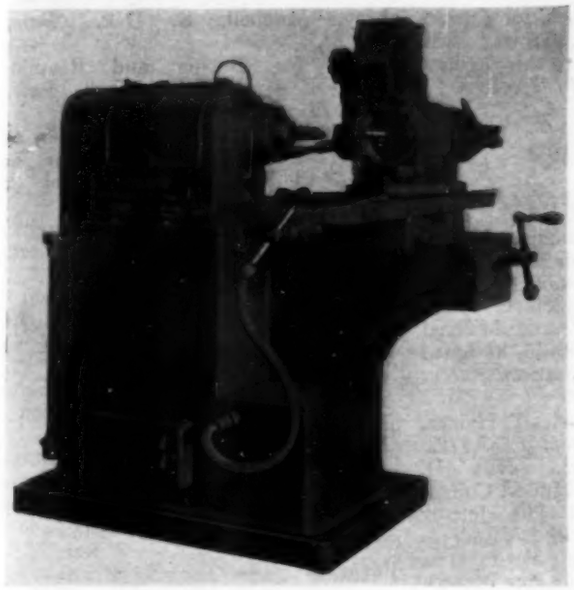
Tuthill Model L Hydraulic pump with bracket, available in six sizes from 3 to 180 g.p.h. at 200 lb. per sq.in.

Among the construction features are: a mechanical seal that eliminates packing; flexibility of mounting through a standard design, primarily arranged for end mounting with an optional bracket for users desiring foot type of mounting; upright ports to maintain priming, and a ground housing bore to maintain the pressure.

Peerless No. 3 Gear-Tooth Chamfering Machine

The improved model of the No. 3 Peerless gear-tooth chamfering machine, announced by the City Machine & Tool Works, East Third at June, Dayton, Ohio, is much heavier and sturdier and has the knee integral with the base. The spindle mounting is fixed, and the fixture head is an integral part of the table. These features provide for greater production speeds, with increased rigidity and freedom from vibration. The cylindrical base in the fixture head is graduated to facilitate setting.

Instead of using V's for the sliding arm on which the work is moved back and forth from the cutter spindle, the improved machine employs a large cylindrical bearing surface, with a sturdy arm sliding back and



lubricating qualities. Four sizes are available ranging in capacity from 2 g.p.m. at 300 r.p.m. to 40 g.p.m. at 1,200 r.p.m.

Among the constructional features are: Ball bearings to absorb the thrust and radial loads of the rotor; compactness obtained by a standard mounting design primarily arranged for end mounting with an optional bracket; and maintenance of priming by the use of upright ports.

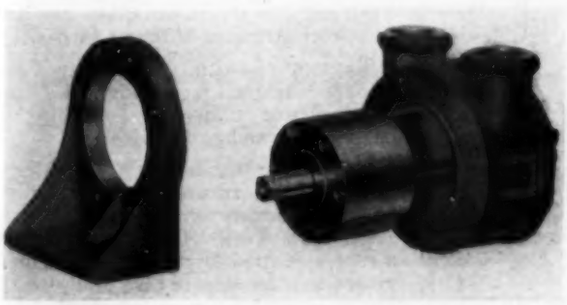
Operating features include efficiency as high as 70 per cent on good grades of lubricating oil; direct-motor drive at speeds up to 1,200 r.p.m.; and ability to drive the pump in either direction of rotation.

forth. This decreases the wear and gives better performance at the heavier production feeds. A motor mounting in the base provides adequate room for convenience in installation.

The improved model offers the flexibility of the former type in shape of chamfer, roundness, intermittent cutting, either straight 45 deg. or ball point, and skipping one or more teeth on a recessing or chamfering operation.

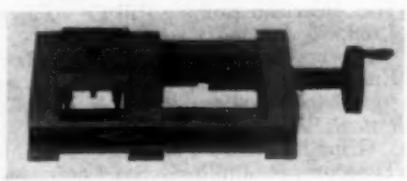
Tuthill Model CP Oil Pumps

For hydraulic applications, but also suitable for handling lubricating liquids, the Tuthill Pump Company, Chicago, Ill., has announced a line of ball-bearing pumps designated as model CP. These pumps are of the rotary, internal-gear, positive-delivery type, with an improved stuffing box and incorporating ball bearings. They are built to handle pressures up to 200 lb. per sq.in. on liquids with fair



"Bay State" Handy Vise

A vise with step jaws to hold work parallel without using parallels has been placed on the market by the Bay State Tool & Machine Company, 412 Albany St., off St. James Ave.,



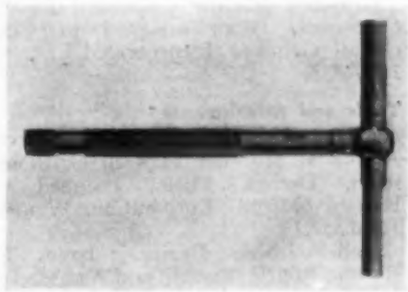
Springfield, Mass. This vise weighs 14 lb., but has a 6-in. jaw opening, and is capable of handling a large variety of work without clamps, parallels, or other tools.

The narrow step jaw enables the operator to tap or drill holes close to the edge of the work. Telescopic screws for setting the jaws give quick action and reduce by one-half the projection of the screw when the jaws are fully open. A V-section is provided in the jaw for holding small punches for grinding or drilling. The open bottom gives projection clearance. The width of the jaw is 5½ in.

A smaller vise, weighing 7 lb., has a 4¼-in. wide jaw with a 4-in. opening.

Lufkin Telescoping Gage

Both plungers of the telescoping gage announced by the Lufkin Rule Company, Saginaw, Mich., telescope. Because of this fact, and because the handle remains always in the center, better balance is obtained and more accurate measurements result. The plungers can be locked by a slight turn of the knurled screw in the end of the handle. The ends of the



plunger are hardened and ground to a radius that gives a clearance in the smallest hole the gage will enter.

This gage is manufactured in five sizes to enter holes from ½ to 6 in. in diameter, and is offered either separately or in sets arranged in compact red leatherette cases.

PATENTS

DECEMBER 30, 1930

Metal-Working Machinery

Commutator-Turning Lathe. Harry G. Miller, Denver, Colo. *Patent 1,786,442.*

Nut-Feeding Mechanism. Julius E. Williams, Willoughby, Ohio, assigned to Republic Steel Corporation. *Patent 1,786,469.*

Gear-Cutting Machine. Francis T. Swain, Newcastle, Ind. *Patent 1,786,551.*

Gear-Cutting Machine. Francis T. Swain and Merle C. St. Clair, Newcastle, Ind. *Patent 1,786,552.*

Electroplating Apparatus. Kazimierz Baranowski, Paris, France, assigned to

Wladimir J. Einstein, London, England. *Patent 1,786,592.*

Completely Automatic Gear-Cutting Machine. Herbert J. White, Rochester, N. Y., assigned to Gleason Iron Works. *Patent 1,786,689.*

Machine for Producing Gears. Edward W. Bullock, Albert P. Schauseil, Alfred W. Draeseke, Clarence T. Galloway, and Maxwell H. Hill, Rochester, N. Y. *Patent 1,786,697.*

Machine for the Production of Mesh Fabric and Chains. Karl Kindl, Grafenhausen, near Neuenburg, Germany, assigned to Ernst Dideon Bek, Pforzheim, Germany. *Patent 1,786,953.*

Change-Gear Mechanism. William Thomas Carling, Guildford, England. *Patent 1,786,980.*

Seam-Welding Machine. William H. Gibb, Bay City, Mich., assigned to Thomson-Gibb Electric Welding Co. *Patent 1,787,039.*

Welding Machine. George S. Lewis, Oak Park, Ill. *Patent 1,787,115.*

Riveting Machine. Heinrich Elsner, Dresden, Germany. *Patent 1,787,190.*

Grinding Machine. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. *Patent 1,787,337.*

Tools and Attachments

Means for Mounting Bearings on Arbors in Multiple. Lowell C. Blomstron, Detroit, Mich., assigned to Federal Mogul Corporation. *Patent 1,786,557.*

Roll-Polishing Device. James R. Byrum, Roy V. Russell, and Asa Meeks, Middletown, Ohio, assigned to The American Rolling Mill Co. *Patent 1,786,820.*

Feeding Device for Machine Tools. Karl Tessky, Esslingen-on-the-Neckar, Germany. *Patent 1,786,876.*

Inserted Tooth for Saws. Elijah C. Orr, Seattle, Wash., assigned to Orr Saw Tooth Grinder Co. *Patent 1,786,959.*

Tool - Retailing Coupling. Edward W. Stevens, Detroit, Mich., assigned to Chicago Pneumatic Tool Co. *Patent 1,787,178.*

Tool - Retaining Coupling. Edward William Frank Zimmermann, Waverly, N. Y., assigned to Ingersoll-Rand Company. *Patent 1,787,229.*

Furnaces

Apparatus For and Art of Treatment of Metal Work. Heyman Rosenberg, New York, N. Y. *Patent 1,786,508.*

Method of Operating Carburizing Apparatus. Richard Kaier, Cranford, N. J., assigned to The Singer Manufacturing Co. *Patent 1,786,951.*

Furnace. William F. Detwiller, Tarentum, Pa. *Patent 1,787,307.*

Processes

Electric Welding. John F. Lawson, Brooklyn, N. Y. *Patent 1,786,759.*

Welding Process. Hugh G. Spilsbury, Cranford, N. J., assigned to Francis Earle. *Patent 1,787,056.*

Method of Shaping Edges for Fusion Welding. Harold J. Grow, East Orange, N. J., assigned to Air Reduction Co., Inc. *Patent 1,787,247.*

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Metal-Working Machinery

Plate Feeding and Punching Means. Carl O. Swenson, Chicago, Ill., assigned to Union Battery Co. *Patent 1,787,458.*

Centrifugal Casting Machine. John A. Byers, Evanston, Ill., and Michael C. Smotzer, Coshocton, Ohio, assigned to Centrifugal Pipe Corporation. *Patent 1,787,567.*

Pickling Machine. Charles T. Haines, Youngstown, Ohio. *Patent 1,787,819.*

Bit-Forming Machine. Nils D. Levin, and Ernst Feodor Muller, Columbus, Ohio, assigned to The Jeffrey Manufacturing Co. *Patent 1,787,827.*

Cushion for Sheet-Metal Presses. Frederich J. Rode, Chicago, Ill., assigned to Marquette Tool & Mfg. Co. *Patent 1,787,996.*

Roll-End Grinder. George W. Binns and Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. *Patent 1,788,046.*

Power-Press. Robert W. Strout, Brooklyn, N. Y., assigned to E. W. Bliss Co. *Patent 1,788,071.*

Machine Tool. Robert L. Hibbard, Bellevue, Pa., assigned to William K. Stamets. *Patent 1,788,193.*

Machine for Making Radiators and Other Structures. Thomas E. Murray, Jr., and Le Roy Hoffer, Brooklyn, N. Y., assigned to Metropolitan Engineering Co. *Patent 1,788,201.*

Spiral-Pipe Machine. Frederick L. Williams, Denver, Colo., assigned to The American Rolling Mill Co. *Patent 1,788,220.*

Process of Reforming Splice Bars. Emanuel Woodings, Oakmont, Pa., assigned to Woodings Forge & Tool Co. *Patent 1,788,225.*

Grinding and Polishing Machine. Theodore F. Philippi, St. Louis, Mo. *Patent 1,788,249.*

Lathe Having Front and Rear Tool Slides. Wilhelm Heinemann, St. Georgen, Germany. *Patent 1,788,294.*

Tools and Attachments

Belt Tightener for Machines for Expanding Metal. James H. Dean, Ludington, Mich., and George W. Baker, Chicago, Ill., assigned to United States Gypsum Co. *Patent 1,787,514.*

Threading Tool. Frederick W. Robert-Shaw, Pittsburgh, Pa. *Patent 1,787,798.*

Cutting Die. Frank Ditchfield, Cleveland, Ohio, assigned to Youngstown Steel Door Co. *Patent 1,787,815.*

Punching Die. Frank Ditchfield, Cleveland, Ohio, assigned to The Youngstown Steel Door Co. *Patent 1,787,816.*

Belt Tightener. Frank H. Humphrey, Mitchell, S. Dak. *Patent 1,787,865.*

Tool for Boring and Reaming. George E. Moen, Kelso, Wash. *Patent 1,787,871.*

Floating Tool Holder. Albert F. Breitenstein, New Haven, Conn., assigned to The Geometric Tool Co. *Patent 1,787,932.*

Punching Device. Hans Hoochreiner, Elizabeth, N. J., assigned to Electro Dynamic Co. *Patent 1,788,023.*

Index for Machine Tools. David C. Klausmeyer, Cincinnati, Ohio, assigned to The Cincinnati Bickford Tool Co. *Patent 1,788,163.*

Work Receiver for Automatic Screw Machines. John Karcevsk, Chicago, Ill. *Patent 1,788,240.*

Ejector for Taper-Shank Cutting Tools. John Elmer Anderson, Keene, N. H., assigned to Kingsbury Machine Tool Corporation. *Patent 1,788,268.*

Furnaces

Furnace-Wall Construction. John E. Anderson, Chicago, Ill., assigned to Plibrico Jointless Fire Brick Co. *Patent 1,787,464.*

Heat-Treatment of Magnetic Material. Gustaf W. Elmen, Leonia, N. J., assigned to Western Electric Co. Inc. *Patent 1,788,017.*

Apparatus for the Heat Treatment of Metalliferous Materials. Richard Albert Stokes and Edwin Gilbert Llewellyn Roberts, London, England, assigned to E. M. S. Industrial Processes, Ltd., London, England. *Patent 1,788,351.*

Process of Heat-Treating Steel. Frank A. Fahrenwald, Chicago, Ill. *Patent 1,787,977.*

TRADE PUBLICATIONS

HEATING EQUIPMENT. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has brought out a Catalog C-247, consisting of 100 pages of operating data, charts, tables and installation photographs, in addition to specifications and illustrations, on industrial heating equipment. It contains definitions of terms relating to heat-treatment operations and gives cost data and descriptions of different furnaces.

TAPPING BENCH. The Bay State Tool & Machine Co., Springfield, Mass., has available a circular describing its hand tapper and handy vise.

EMPLOYEE MAGAZINES. The Metropolitan Life Insurance Co., Policyholders Service Bureau, 1 Madison Ave., New York, N. Y., has compiled a report entitled "Employee Magazines" presenting the results of a study of the principles and practices involved.

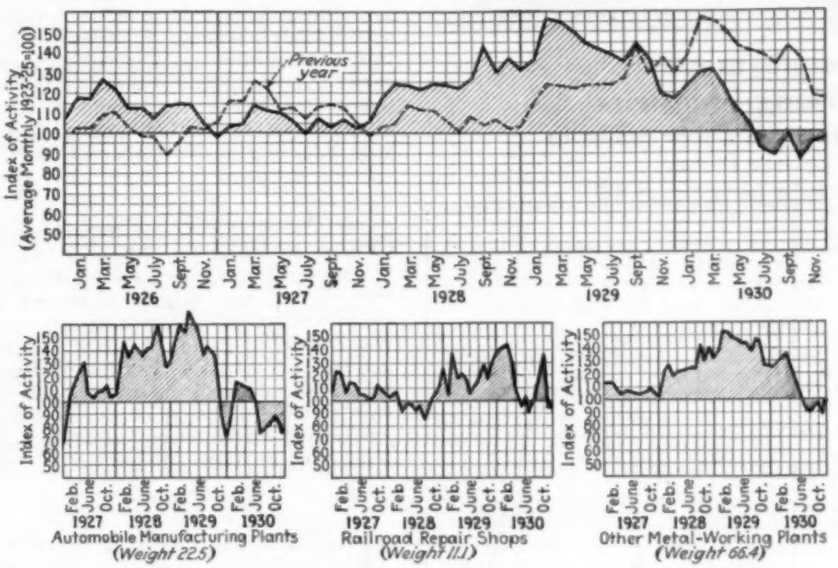
NEWS OF THE WEEK

Industrial Production Index Holds Well in December

A SLIGHT decline in general metal-working activity from 95.7 in November to 92.5 in December is indicated by reports on the consumption of electrical energy for power purposes. Though September operations showed a decided upturn from those of August, the October decline more than equalled the previous advance. The November advance, almost as sharp as the previous drop, tapered off. Figures are corrected for 26 working days.

The automobile shop index stands at 77.9 for December, as compared with 74.9 for November, 80.9 in October, and 88.4 in September. This reflects the slight advance just before the first of the year which has since been further accentuated. The railroad shop index for December, corrected for 26 working days as are all other figures, stands at 91.8, as compared with 97.8 in November, 96.0 in October, and 136.1 in September. Ferrous and non-ferrous metal-working plants outside the two aforementioned classes had a December index of 97.8, as compared with 99.4 in November, 87 in October, and 97.4 in September.

Seasonal adjustments revise the figure slightly. The December final index figure for automobile shops, seasonally adjusted, is 113.9, that of the railroad shops is 90.3, and that of the metals group outside these classifications 101.0, giving a combined percentage of 102.6. Comparative figures for November are: 88.3, 92.9, 104.0, and 99.2.



Annual Motorboat Show Now On in New York

The twenty-sixth annual motor boat show in the Grand Central Palace, New York City, opened last Friday to continue throughout the present week. More than 200 exhibitors have displays of boats, engines, and accessories. The S.A.E. will hold a technical session in conjunction with the National Association of Engine & Boat Manufacturers on Jan. 22 at the Grand Central Palace. Papers include: "The Automotive Type Engine for Marine Service," by H. C. Fromm, "Engines Designed for Marine Use Only," by R. H. Garrison, and "Fitting the Boat to the Engine," by A. E. Luders. The annual motorboat luncheon of these organizations will follow this session. A resumé of the show, and the meetings in conjunction, will appear in next week's *American Machinist*.

ACCORDING to a recent announcement, there were 130,000 visitors at the National Power Show. All attendance records were broken.

Western Congress Program

Thirteen prominent technical societies will participate in the Western National Metal Congress and Exposition, to be held Feb. 16-20 in the Civic Auditorium, San Francisco. These include the A.W.S., A.I.M.E., A.I.E.E., A.S.M.E., A.S.S.T., Institute of Metals, National Purchasing Agents' Association, Pacific Coast Electrical Association, Pacific Coast Gas Association, S.A.E., A.S.T.M., and National Association of Power Engineers. Some 110 companies have already been listed as exhibitors. The program of technical papers of interest to the metal-working industry is as follows:

Society of Automotive Engineers—Steel Session

"Automotive Steels"—J. M. Watson, chief metallurgist, Hupp Motor Car Co., Detroit, Mich., and president, A.S.S.T.

"Steel Personality"—B. F. Shepherd, chief metallurgist, Ingersoll Rand Co., Phillipsburg, N. J.

"Testing and Predetermining Characteristics of Auto Engines"—Arthur B. Domonoske, Executive Head of the Mechanical Engineering Department, Stanford University.

Society of Automotive Engineers—Non-Ferrous Session

"Aluminum Alloys"—William H. Holzhaur, Aluminum Co. of America.

A.I.E.E. and Pacific Coast Electrical Association

"Electricity in the Steel Mills"—G. E. Stolz, Westinghouse Electric & Manufacturing Co.

"Use of Electricity in Heat-Treating of Steels"—George W. Bernhard, Pacific Gas & Electric Co.

A.I.M.E.

"Improvements in the Physical Characteristics in Large Carbon and Alloy Steel Castings"—J. Fenstermacher, Columbia Steel Corporation.

"Manganese Steels"—Donald H. Young, American Manganese Steel Co.

"The Formation and Elimination of Non-Metallic Inclusions in the Acid Open-Hearth Process"—C. H. Herty, Jr., United States Bureau of Mines.

"High-Test Cast Iron"—F. B. Coyle, International Nickel Co.

A.S.M.E.

"Nitriding"—Dr. O. E. Harder, Assistant Director, Battelle Memorial Institute.

"Machinability of Metals" — A. H. d'Arcambal, Metallurgist, Pratt & Whitney Co.

"Creep of Metals at Elevated Temperatures"—P. G. McVetty, Westinghouse Electric & Manufacturing Co.

Pacific Coast Gas Association

"Gas Furnaces for Nitriding"—James H. Knapp, James H. Knapp Co.

"Carburizing Steel by Gas"—R. G. Guthrie, Peoples Gas Light & Coke Co.

"Gas Furnace Development"—C. B. Phillips, Surface Combustion Co.

"New Applications of Gas to the Factory"—Edward DeRemer, Los Angeles Gas & Electric Co.

"Progress and Development of Fuel-Fired Furnaces"—E. G. deCoriolis, Surface Combustion Co.

American Chemical Society

"Review of Corrosion for 1930"—F. N. Speller, National Tube Co.

"Corrosion and Lubrication of Valves"—George F. Scherer, Merco-Nordstrom Valve Co.

"Chromium and Chrome-Nickel Steels"—M. J. R. Morris, Chief Metallurgical Engineer of Republic Steel Corporation.

American Welding Society

"Welding of Alloy Overlays"—Miles C. Smith, Stoody Co.

"Fusion Welding"—J. C. Hodge, Metallurgist, Babcock & Wilcox Co.

"Welding Aluminum and its Alloys"—W. N. Dunlap, Aluminum Research Laboratories, Aluminum Company of America.

"Electric Arc Welding"—A. F. Davis, Lincoln Electric Co.

Market Research Appropriation Rejected by House Committee

PAUL WOOTON
Washington Correspondent

WASHINGTON, D. C., Jan. 16—Despite recommendations of the budget, the House appropriations committee has disapproved an item in the Commerce Department appropriation bill which would permit the machinery division to compile market information to assist the machinery industry in its sales in the United States. The Commerce Department appropriation bill was reported to the House on Jan. 13 with the section eliminated that would have provided for market research work in connection with machinery.

Department of Commerce officials appeared before the House appropriations committee and testified that the proposed research work would be of great benefit to machine manufacturers in readjusting their sales plans and in allocating their sales territories. A total increase of $77,000 was sought for export industries. It was proposed to finance the machinery market research work in the United States by using part of this increased appropriation. The committee, however, disallowed the entire $77,000.

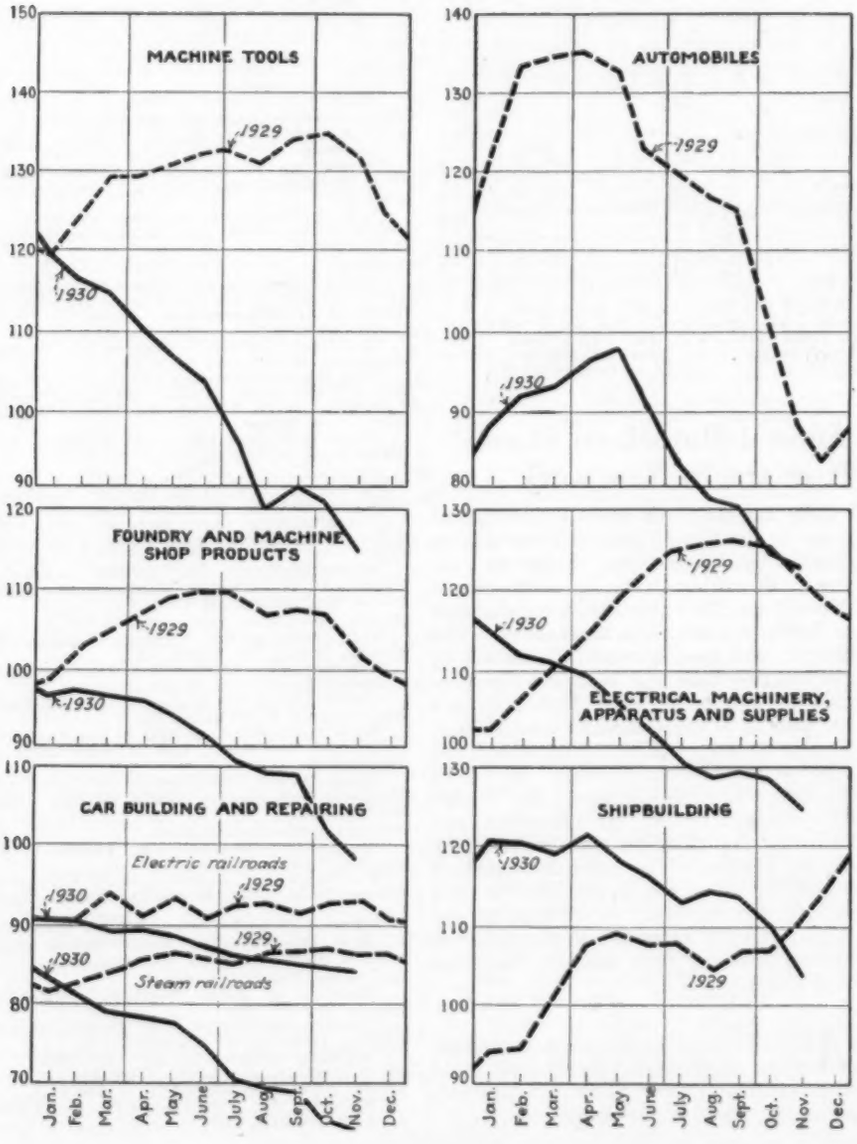
It was proposed to use part of the increase for the establishment of a section devoted to the study of foreign advertising media. The committee was informed that industrial exporters have experienced considerable difficulty in determining the proper foreign magazines and newspapers to carry their advertising messages. While the House committee has disallowed the increased appropriation, an attempt will be made to have the items reinserted in the bill in the Senate.

Thirty-eight aircraft, valued at $696,012, were exported during November. This compares with 30 aircraft, valued at $335,591, in November, 1929. There also was an upturn in the export of aircraft engines. In November, 36 engines, valued at $142,431, were sent to foreign destinations, as compared with 17 engines in November of 1929, valued at $88,449. There was a slight decrease in the value of aircraft parts and accessories exported last November. In that month shipments out of the country were valued at $229,219, as compared with $242,575 in November of 1929.

Trend of Employment In the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



SIMPLIFIED Practice Recommendation R118-30 on Abrasive Grain Sizes, mailed to manufacturers, distributors, users, and others interested in simplification of abrasive grain sizes under date of June 11, 1930, by the Bureau of Standards, has received sufficient acceptance from industry to insure general adoption of the program. The recommendation may, therefore, be considered effective forthwith.

"INDUSTRIAL Traffic Management" is the subject of a study just completed by the Department of Commerce. The survey was undertaken by the Bureau of Foreign and Domestic Commerce in co-operation with national and local traffic organizations throughout the country. Copies of the booklet may be obtained at $0.30 from the Government Printing Office, Washington, D. C.

Speedier Action Claimed On Patent Applications

Increased personnel, salaries, and a coordinated system of supervision have caused considerable increase in efficiency of the Commerce Department's patent office, with a consequent decrease in the time necessary for the granting of patents, according to Thomas E. Robertson, Commissioner. The average time an applicant must wait for an official action upon his patent application has been reduced about five weeks to an average of nine months. During the past 12 weeks the Patent Office has acted upon 12,000 more cases than it has received, thus diminishing the number of arrears from 120,000 applications to fewer than 108,000.

"Chicago Appraisal Plan" Subject of Complaint

The "Chicago Appraisal Plan" is condemned in a formal complaint issued by the Federal Trade Commission against the Chicago Machine Tool Distributors, its directors, executive committee, and members, alleging unfair methods of competition. Details of the plan, put into effect Oct. 1, 1928, but formally adopted on April 12, 1929, are cited by the commission as follows: "Since Oct. 1, 1928, said respondents, Chicago Machine Tool Distributors, its board of directors, executive committee, and members of said association, have been and are now engaged in combining and co-operating together and among themselves in the operation and carrying out of said 'Chicago appraisal plan'.

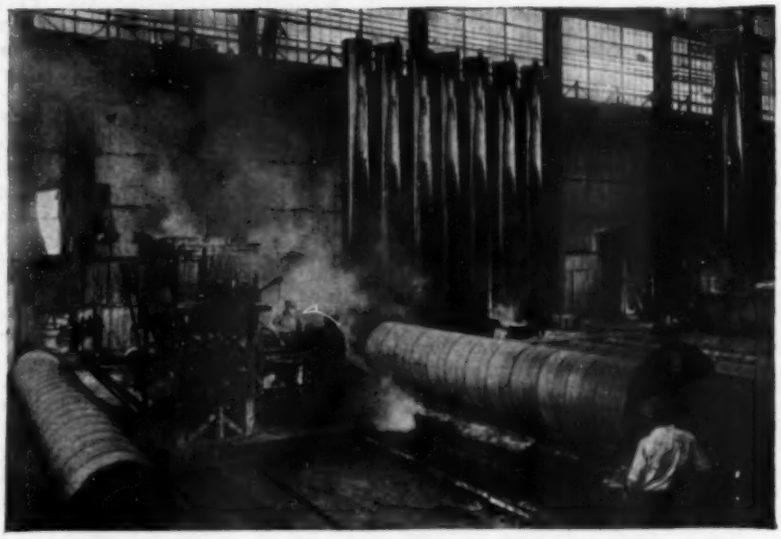
"The 'Chicago appraisal plan' is for the purpose, and has the effect and result of restricting, restraining, and suppressing competition in interstate commerce between the respondent members of respondent association in the purchase and sale of old machines or machinery which are offered in part payment on a new machine or machinery by purchaser, and the purchase and sale of new machines or machinery, and results in said purchasers being deprived of free, open competitive market for their said used or old machines or machinery which they would have access to and enjoy in the absence of the "Chicago appraisal plan" which is being operated through the co-operation of said respondent Chicago Machine Tool Distributors, and the individual respondent officers, directors, executive committee, and members of said association."

The commission designated Jan. 16 as the final date upon which the respondents might file an answer.

1929 Machine Production Sets Record in Canada

According to a report just issued by the Dominion Bureau of Statistics, Canada's machinery industry had a new high value of production in 1929 when the output had a selling value of $65,692,539, representing an increase of 29 per cent over the value of production in 1928, the previous record year. The 1929 production was 47 per cent ahead of that in 1927. The report for 1929 shows that 169 plants were in operation with a capital employed of $75,226,204.

The industry has registered annual increases for the past five years. The report shows that Ontario had 120 plants out of the total of 169, with Quebec next with 28; British Columbia with eight and Manitoba with seven. There was also one plant in New Brunswick, four in Saskatchewan, and one in Alberta. The capital employed in Ontario was $49,279,134, and in Quebec, $24,086,518.



Pipe dipping and wrapping department, Western Pipe & Steel Co. (San Francisco plant). Standing against the far wall are 40-in. wrapping machine, finishing the pipe that forms the new 16-mile water supply pipeline of the city of San Diego

BUSINESS ITEMS

It will require United Engineering & Foundry Co. several months to construct the equipment for the new Otis Steel Co. continuous mill, contract for which has just been placed. The contract is the first of its type to be announced this year, and compares favorably in size with any placed during 1930.

The Industrial Plants Corporation, 25 Church St., New York, N. Y., has established an Ohio branch with offices in the Columbian Bldg., Columbus, Ohio. First of its sales will be the trustee's auction of all properties of the Chard Lathe Co., Newcastle, Ind., on Jan. 27.

Alloy Welding Processes, Ltd., and the Premier Electric Welding Co., Ltd., have been amalgamated into Murex Welding Processes, Ltd., with offices and works at Ferry Lane Works, Forest Road, Walthamstow, London, E.17, England.

The Detroit Gray Iron Foundry will start construction immediately of a $100,000 plant unit. Equipment will include five 10-ton traveling cranes.

The Southwark Foundry & Machine Co., Akron, Ohio, has transferred the major portion of its assets to the Baldwin-Southwark Corporation, as of Dec. 31, 1930. The latter corporation has assumed all outstanding liabilities and will carry on the entire business. New address of the Southwark unit is Baldwin-Southwark Corporation, Paschall Station Post Office, Philadelphia, Pa.

The A. O. Smith Corporation, Milwaukee, shipped 472,000 tons of electrically welded pipe during 1930, as compared with 425,000 tons in 1929.

The Shurly Dietrich Co., Ltd., Galt, Ont., has merged with the Canadian interests of E. C. Atkins & Co., Hamilton, Ont., (main plant and head office is at Indianapolis, Ind.). Plant facilities of E. C. Atkins & Co., at Hamilton will eventually be removed to Galt. The consolidation became effective as of Jan. 1, and the business hereafter will be under the name of Shurly Dietrich Atkins Co. Ltd. The Shurly Dietrich Co. is the oldest and only Canadian-owned saw manufacturing concern in Canada, having been established at Galt in 1873.

The Milwaukee Electric Crane & Hoist Corporation, which has been operating as a subsidiary of the Harnischfeger Corporation, Milwaukee, since 1928, has been consolidated with the crane and hoist division of the parent company. D. B. Patterson, Manager of the Milwaukee Electric Crane & Hoist Corporation, and vice-president of the Harnischfeger Sales Corporation, is now in charge of the crane and hoist sales of both companies. N. P. Farrar is industrial sales manager of the crane and hoist divisions of both companies.

The Waterloo-Sunshine plant, Waterloo, Ont., in which the Waterloo Manufacturing Co. and the S. V. McKay Co., of Australia, have equal interests, was opened officially on Jan. 8. The building was erected at an estimated cost of $275,000.

The Kari-Keen Manufacturing Co., resumed production Jan. 3 with a force of 200, and C. H. Myers, president, said unfilled orders on hand indicated continuation of activity for two months at least. The plant has been idle two months since production of heater units halted. Current output will be at rate of 200 to 300 units daily, against a maximum production of 1,000.

PERSONALS

W. L. Allen, Vice-President of the American Rolling Mill Co., Middletown, Ohio, and formerly president of the Sheffield Steel Co., Kansas City, Mo., previous to its consolidation with Armco, will succeed S. H. Hale as chairman of the board of the Gleaner Combine Harvester Corporation, Independence, Mo.

E. W. Beatty, President of the Canadian Pacific Railroad, has been elected a director of the International Nickel Co. of Canada, Ltd., to fill the vacancy caused by the recent death of Lord Melchett.

Carl V. Beman, Plant Manager of the International Casket Hardware Co., Thompsonville, Conn., for the past ten years, has resigned to become manager at the Morgan Silverplate Co., Winsted, Conn.

Frederick F. Brand has been appointed managing engineer of the power transformer department of the General Electric Co., Pittsfield, Mass., to succeed F. W. Peek, Jr., recently appointed chief engineer of the Pittsfield works.

E. C. Burton, Vice-President of Link-Belt, Ltd., Toronto, Montreal, and Vancouver, recently announced the appointment of a number of sales representatives. The Manitoba Bridge & Iron Works, Ltd., of Winnipeg, will represent Link-Belt in Manitoba and Saskatchewan. H. B. Lyall is vice-president and general manager. The Riverside Iron Works, Ltd., Calgary, will represent Link-Belt in southern Alberta. F. L. Irving is manager.

John L. Carter, Chairman of the Cost Committee, Gray Iron Institute, and an executive of the Sacks-Barlow Foundries, Inc., Newark, N. J., discussed foundry costs at the Jan. 14 meeting of the Philadelphia Foundrymen's Association. Charles A. Klaus, also of Newark, led the discussion.

Fred H. Colvin, editor of *American Machinist*, has been made a member of the Sectional Committee on the Standardization of Allowances and Tolerances for Cylindrical Parts and Limit Gages of the A.S.M.E.

Harry B. Curtis, Treasurer of the Bridgeport (Conn.) Hardware Mfg. Corp., was elected director-at-large of the National Association of Manufacturers.

John F. Deasy has been appointed vice-president in charge of the Central region for the Pennsylvania Railroad, to succeed E. W. Smith.

J. J. Dunn, formerly general superintendent of the Ellwood City (Pa.) Works, National Tube Co., Pittsburgh, has been appointed assistant to the vice-president at the general offices in Pittsburgh. J. W. Offutt, formerly assistant general superintendent at Ellwood City, succeeds Mr. Dunn. G. E. Moyer, formerly assistant superintendent of production, succeeds Mr. Offutt. Earl W. Brown, assistant general superintendent at the Lorain (Ohio) Works, has been appointed general superintendent, succeeding Charles Fell, retired. J. L. Mauthler and P. P. Reese have been made assistant general superintendents at Lorain.

A. E. Dyment, Chairman of the board of directors of the Canadian General Electric Co., Ltd., has been elected to the directorate of the Montreal Trust Co.

S. J. Ellis, head of the Vulcan Iron Works, Memphis, Tenn., for 24 years, has retired. The company has been incorporated as Vulcan Iron Works, Inc., by his sons, William C. Ellis, now president and general manager, and Crockett Ellis, now secretary-treasurer.

L. W. Greve, head of the Cleveland Pneumatic Tool Co., Champion Machine & Forging Co., and the Cleveland Rock Drill Co., is president of National Air Races, Inc., the non-profit group of business men who will underwrite and sponsor the annual national airplane races in Cleveland for the next ten years.

H. W. Hardinge, President, the Hardinge Co., York, Pa., sailed recently for Europe.

Walter Harnischfeger, formerly vice-president of the Harnischfeger Corporation, Milwaukee, has been elected president and treasurer to succeed his father, Henry Harnischfeger, who died on Nov. 15. Ernst Standfuss remains vice-president and R. Binkowski, secretary. F. J. Hartmann has been elected assistant secretary and Carl Haugaard, assistant treasurer.

T. McLean Jasper, Director of Research for the A. O. Smith Corporation, Milwaukee, discussed problems in the construction and testing of high-pressure pipes and other vessels before the Madison (Wis.) Technical Club on Jan. 5.

C. H. Keeney has been appointed sales manager of the Northern Blower Co., Cleveland, Ohio. He has been identified in this field for about 25 years.

George F. Libbey has been appointed director of sales of the Master Lock Co., Milwaukee. He was formerly assistant sales manager.

COLEMAN SELLERS
New member, Machine-shop Practice Division

James W. Hook, President of the Geometric Tool Co., New Haven, Conn., has been appointed chairman of the State Committee on Unemployment by Governor Trumbull.

H. N. Lister, Secretary of the Canadian Electrical Association for the past five years, has resigned that post to take over the management of the Dominion Welding Engineering Co., Ltd. Mr. Lister is an associate member of the Engineering Institute of Canada and of the Corporation of Professional Engineers of the Province of Quebec.

Dr. Edward E. Marbaker, Vice-President of the Industrial Research & Engineering Co., Pittsburgh, formerly director of foundry research of the Whiting Corporation, led discussion at the January meeting of the Pittsburgh Foundrymen's Association at the Fort Pitt Hotel on Jan. 15.

P. J. McIntyre, who for the past 7 years has been associated with the Wolverine Tube Co., as research and chief engineer, has resigned to open an office under the name of the McIntyre Engineering Co., 403 W. Baltimore Ave., Detroit, Mich. He will devote his time to consulting engineering capacities on brass and copper tube products and production machinery for this class of work.

Bernhard Olsen, for the past six years manager of the Spokane office of the General Electric Co., has been named manager of the Indianapolis office, succeeding R. W. Mercer, who has been assigned to special work. J. R. Murphy of the Seattle office has been appointed manager of the Spokane office, succeeding Mr. Olsen.

R. L. Pearson, formerly chief engineer, has been appointed assistant to the general manager of the New York, New Haven & Hartford Railroad Co., New Haven, Conn. E. E. Oviatt succeeds Mr. Pearson as chief engineer. A. L. Bartlett was named engineer of maintenance of way, and W. T. Dorrance was appointed assistant to the chief engineer.

Gordon F. Perry, elected to the reorganized board of the Canadian National Railways, is chairman of the board of the English Electric Co. of Canada, Ltd.; president of the National Iron Corporation; director of Page, Hersey Tubes, Ltd., the Lake Superior Corporation, the Algoma Steel Corporation, and is a member of the advisory board of the Royal Trust Co.

O. C. Roberts has been appointed general manager of the Peter Smith Stamping Co., Fordson, Detroit, Mich. J. R. Winter, in charge of plant, and Z. C. Wilkinson, in charge of sales, have resigned.

Chauncey A. Sherman, Manager Factory G, International Silver Co., Thamesville, Conn., for the past 32 years, has resigned. Bennett M. Gaines, Superintendent of Plant, succeeds Mr. Sherman.

H. O. Stephens, I. H. Sclater, and A. B. Hendricks, Jr., have been ap-

pointed assistant engineers of the power transformer department, General Electric Co., Pittsfield, Mass., of which F. F. Brand is managing engineer.

L. W. Stevens, Superintendent of Veeder-Root, Inc., Hartford, Conn., has been appointed general manager at Hartford and Bristol plants. H. L. Spaunburg, Factory Manager at Bristol, has been named chief engineer of the company and all engineering facilities will be consolidated at Hartford. To succeed these two men, Richard James has been appointed superintendent at Hartford and K. D. Graham becomes manager at Bristol.

W. A. Thorpe has been appointed assistant to the manager of the Federal and Marine Department, General Electric Co., Schenectady, N. Y., according to an announcement made by the manager of the department, D. W. Niven.

C. P. Yoder, formerly sales manager of the Erie County Electric Co., Erie, Pa., has been appointed industrial heating engineer for the Niagara Hudson Power Corporation with headquarters at Buffalo.

C. E. Tompkins, formerly with the Westcott Chuck Co., has been appointed sales manager of the David Maydole Tool Corporation, Norwich, N. Y.

C. R. Messinger
Now President, Oliver Farm Equipment Co.

Dwight H. Wagner has been elected president of the Wheeling (W. Va.) Corrugating Co., to succeed W. H. Holloway, who was recently named president of the Wheeling Steel Corporation to succeed Isaac M. Scott. Other officers of the Wheeling Corrugating Co., named at the recent meeting include: vice-president in charge of operations, W. E. Ackerman; vice-president in charge of sales, J. O. Entrekin; secretary, Ernest G. Walter, and treasurer, Elmer A. Rose.

George S. West, for several years master mechanic at the Olean (N. Y.) shops of the Pennsylvania Railroad, has been appointed superintendent of motive power for the company, with headquarters in Indianapolis.

Dr. Robert C. Williams has been appointed a member of the technical staff, Battelle Memorial Institute, Columbus, Ohio.

OBITUARIES

Walter F. Baker, President of Charles F. Baker & Co., Boston, died on Jan. 2. He had been head of the company since 1911.

Edgar Benham, 55, Vice-President of the Mosler Lock Co., Covington, Ky., died recently.

Leslie G. Berry, President of the Southern Engineering Co., Charlotte, N. C., died there on Jan. 3.

William C. Farnum, 81, manufacturing executive and noted inventor, died at Fitchburg, Mass., Jan. 6. He was inventor and designer with the Walter A. Wood Mowing & Machine Co., Hoosick Falls, N. Y. Later he became designer of railway appliances for the Canadian Pacific Railroad at Montreal, and was superintendent of the Miltmore Elastic Steel Car Wheel Co., Arlington, Vt. At one time he operated an experimental shop in Ilion, N. Y.

Edward P. Fitzgerald, 63, Manager for 20 years of the South Boston Office, Colonial Steel Co., Pittsburgh, died at his home in Boston on Jan. 10. He had been with the company for 25 years.

Henry A. Hammond, 58, for many years New York representative of the General Cable Corporation, 420 Lexington Ave., New York City, died on Jan. 1 there. Mr. Hammond had long been connected with the Rome Wire Co., before it became a division of the General Cable Corporation. He had been connected with the company since 1903.

William Gean Harris, 69, President of the Canada Metal Co., Ltd., Toronto, Ont., died there on Jan. 9. He was also president of the Aristocrat Manufacturing Co., Ltd., Grahams Neil Wire Products, Ltd., and Canada Foils, Ltd., all of Toronto.

Ernest H. Huenefeld, 92, President of the Huenefeld Co., Cincinnati, Ohio, died there on Jan. 12.

Archibald Brodie McCulloch, 52, Superintendent for the past 16 years of the Montreal Welding Co., died in a Montreal hospital on Jan. 8. Mr. McCulloch was the first man to introduce acetylene welding in Canada. He arrived in Montreal in 1911 from England, where he had specialized in acetylene research work, and on arrival in Montreal he interested industrialists in the value of such a welding process.

Richard J. Murphy, 68, District Manager of the Massey-Harris Co., at Exeter, Ont., died on Jan. 8 there after a long illness.

John P. Rawlings, 46, president of the Rawlings Motor Co., Mount Kisco, N. Y., died at his home there on Jan. 12.

Harry L. Van Zile, 66, President of the Van Zile Ventilating Co., New York, died on Jan. 7.

James L. Waldie, 59, President of Canadian Tube & Steel Products, Ltd., died suddenly at his home in Montreal on Jan. 9. Mr. Waldie was a native of Montreal, and organizer of the Canadian Iron & Tube Co., the Rolling Mills Co., and the Colonial Wire Manufacturing Co. The two last named were later merged as Canadian Tube & Steel Products, Ltd.

FORTHCOMING MEETINGS

Steel Founders' Society of America — Annual Meeting and Election, Jan. 29, Hotel Hollenden, Cleveland, Ohio. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

Fifth Midwestern Power & Engineering Conference and Exposition —Chicago, Feb. 10-14, 1931. G. E. Pfisterer, 53 West Jackson Blvd., Chicago, secretary.

Western Metal Congress and Exposition—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7106 Euclid Ave., Cleveland, Ohio.

Steel Founder's Society of America—Sales clinic and regular meeting, March 19-20, Neil House, Columbus, Ohio. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

Three-M-Congress — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18. 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., N.Y.C.

American Society of Mechanical Engineers—Calvin W. Rice, executive secretary, 29 West 39th St., New York. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Aeronautic Meeting, Baltimore, Md., May 12-14, 1931.

National Applied Mechanics Meeting, Purdue University, Lafayette, Ind., June 15-16.

American Foundrymen's Association—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

American Gear Manufacturers' Association—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

National Foreign Trade Council —Annual Convention, May 27-29, at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York, N. Y.

American Society for Testing Materials—Annual Meeting, Stevens Hotel, Chicago, June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary-treasurer.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

Better general business conditions for the week contributed to the increased optimism of the New York machinery market. Inquiries of a more substantial nature, representing a good type of business, also added to the cheerful prospect. Although still of a single-order variety they included several from the Navy, among them a toolroom lathe for the Mare Island Yard. Orders themselves held about even. One large organization reports January so far as good as the entire month of December and a good week all around. Dealers are not certain whether the improvement is merely a spurt, is due to generally improving conditions, or is an aftermath of the decision to "buy after the first." The City of New York has ordered 5,000 tons of steel pipe.

NEW ENGLAND

How much better New England machine tool business will be in 1931 than in 1930 depends largely on the recovery of the automotive industry, one executive states. Optimistic reports from automobile centers are not taken too seriously. The trade awaits more tangible evidence than the comparatively few inquiries in circulation.

Thus far January has reached expectations only because very little change was expected. December was a poor month, but some holdover orders from November and December with an improved volume of replacements will result in a better total this month, is the belief. Bath (Me.) Iron Works bid low for building 18 U. S. Coast Guard cutters, the figure being $3,515,000.

CINCINNATI

Machine tool manufacturers express the opinion that market conditions are improving, due to some extent to the fact that there are better psychological influences. Selling agents note no change in the demand in local and adjacent territory but say there are more than a few signs that indicate greater activity is developing gradually.

The past week's sales were largely confined to single tools, purchased by general machinists and miscellaneous users. The business was well scattered over the country and the requirements were well diversified as to sizes and types of tools. Most of the concerns received a good volume of inquiries from all classes of users and for all types of tools.

CANADA

With the railways coming into the market in a large way for rails, rolling stock, and equipment, and with extensive orders being placed for machinery for new manufacturing plants, the outlook for the first quarter is decidedly promising. There are indications that industry generally in Eastern Canada is accumulating a forward momentum which should carry it far toward greater accomplishments.

The Canadian National Railways has placed an order with the National Steel Car Corporation for 1,000 box cars which, added to a large order placed a fortnight ago by the Canadian Pacific Railway, will keep the company's plants busy for several months. The National Railways have also placed orders with Canadian Car & Foundry for 1,700 fifty-ton steel-frame cars, and with the Eastern Car Co., Trenton, N. S., for 500 fifty-ton composite general service cars and 500 seventy-ton composite drop-end gondolas.

Leaders in the electrical industry express the view that the industry should enjoy an expanding field of activity during the coming year. They base their opinion upon the knowledge that equipment requirements for water power projects alone will be exceptionally heavy.

BUSINESS UPTURN, so often reported during recent months, seems again in the offing, but watchers now are much more cautious with their pronouncements. Whether the ships of better business make port or not depends on several factors, among them being their staunchness and the skill of their pilots. Leaving the laggards to their fates, skilled pilots are racing for the harbor mouth; first to win the port wins first prize money. Inquiries in ever-increasing number are spurring them on.

NEW YORK is cheered by real inquiries, orders holding their gain of the preceding week. New England expects January to better December—as do other districts—but gives much of the credit to December holdovers. In common with other sections, New England watches the result of the country's current auto shows. Cincinnati inquiries are better and orders at least hold their own, the general feeling being better. Canadian railways and manufacturing plants are buying equipment, a prospect which tool men believe will better their sales soon. Detroit is decidedly cheerful, with steadily increasing orders, inquiries, and prospects.

BUFFALO reports anticipated improvement and holds promise for later in the year. Indianapolis, seeing steadily increasing manufacturing, expects more tangible reactions in tools soon, with railroads, furniture builders, and coal mining concerns buying. Chicago, maintaining the beginning-of-the-year improvement, anticipates railroad lists shortly. Even San Francisco announces an upturn—making the decision unanimous.

DETROIT

A real ray of sunshine has found its way into the depths of the machine tool trade in the Detroit area. Orders, inquiries, plans, and possibilities are now occupying the attention of dealers and salesmen where only doubts and pessimism existed before.

The last few days have shown a marked advance. Of course the machinery business was at so low an ebb that almost any progress would be very easily noticeable. Not only are the orders increasing steadily, but the inquiries are more optimistic than they have been in a great many months.

So little equipment was purchased during 1930 that the automobile manufacturers have accumulated a vast amount of shortages. In other words they have postponed their purchases so long that they can hardly hope to enter into a comprehensive program of production without making many additions to their equipment. Employment is better than it has been at any time in 15 months.

BUFFALO

As was anticipated, there has already been some improvement in the machine tool business in this district. Several small orders have been placed and inquiries are much more pronounced than before the turn of the year. While no big spurt in business is in progress or expected, at least not for several weeks, it is certain that conditions are much better than before the holidays.

It is significant that the tone of business in this district is much better in every respect. Many industries which had been running on part time or entirely shut down during all or most of December have renewed activities briskly.

INDIANAPOLIS

While it is a little early in the year to make any predictions as to the trend of business in this territory during the first quarter, machinery manufacturers and machine tool men seem to be convinced that the present quarter will exceed business done during the same period last year. A gradual resumption of business in many industries, even though not at capacity seems to be a hopeful indication.

One hopeful sign is the resumption of work in the railroad repair shops, another is the furniture industry. There are no large railroad lists out in this field, but some equipment is being purchased.

The iron and steel trade is rather quiet and their purchases are confined strictly to essentials. Some purchases of special machinery for coal mining are being made, but it is believed this month will see a decline in this business. Much is expected this spring in contractors' equipment.

CHICAGO

While no features are noted in machine tool market developments, reports from various sources indicate that the improvement immediately following the beginning of the year, although slight, is being generally maintained. Inquiries in fairly good volume are reported by selling agents and distributors of standard equipment. Trunk line railroads are said to be preparing sizable lists to be sent out when their annual budgets shall have been approved. Thus far this year the automotive industry has not shown any indication of becoming a very prominent buying factor. Farm implement and tractor manufacturers, reported some time ago as preparing lists of tool requirements, have yet to be heard from. Among new inquiries received is one from the U. S. Engineer's office at Sault Ste. Marie, Mich., for an upright drilling and tapping machine, and one from the government arsenal at Rock Island, Ill., for a double roll feed.

SAN FRANCISCO

At this season of the year there is always a flattening out in Pacific Coast shipping, with the tendency neither upward nor downward. Small gains in one direction are offset by small declines in other directions. There has, however, been a noted improvement in the machine tool trade during the last thirty days and in particular the last two weeks, a number of important inquiries having developed.

A leading San Francisco house dealing in boilers, power plants, and kindred commodities states that its business has maintained a healthy condition, largely because of the government's program through the Jones Act. The forecast, however, in this special line is that a return to normal conditions will not be apparent until the fall and then it will be gradual. Another large machinery house states it is greatly encouraged by the number of requests it has received for specifications for pumping plants and Diesel engines.

BUSINESS · BAROMETER

The business outlook, now encouraging, can be made more so if politics are forgotten

THEODORE H. PRICE
Editor, Commerce and Finance, New York

THAT a calm generally precedes a storm is a statement often made although it is not frequently heeded. Special attention is therefore called to the commercial quietude that was discernible last week.

No one has ever achieved absolute accuracy in predicting the business future, but those who attempt this difficult feat have a better opportunity when things are quiet, as at present, than when the winds are blowing a gale and it is hard to keep the ship on her course. In America the habit of lunching or dining together has been formed by a great many business men. A number of such gatherings have been held since New Year's Day. They all radiated optimism. The President himself spoke in very encouraging tones. So did the Secretary of Agriculture and the officials of the United States Treasury.

In the automobile trade a very distinct improvement is noted. The iron and steel business is looking up, although its output is still said to be 50 per cent under maximum capacity. No one knows the facts, and it would not do to depend on either statement absolutely.

Cotton is distinctly better than it was. The British government is attempting to prevent a lock-out of cotton mill employees that would prostrate the Lancashire industry, and success is expected. Cheap rubber is responsible for announcement last week of the lowest prices at which the indispensable tire has ever sold. Silver went to 13⅛ pence an ounce in London, but it recovered nearly a penny an ounce, and there are many who think that the reaction is only temporary.

An address delivered by Mr. A. H. Wiggin, of the Chase National Bank, has had a very profound effect in emphasizing the importance of buying power abroad upon our trade and internal prosperity. Of course, the local financial authorities would like to see silver and rubber higher, but the supply of monetary silver in this country is so large that it is questionable whether it can ever be re-monetized unless the various nations of Europe join in the action proposed. Most of this silver was brought here in 1896 when the fear of Bryan's election scared our bankers to death, and but few of them had courage enough to defy what appeared to be the compulsion of events.

But one thing seems to be about as certain as any fact can be. East India and China have a population of about 800,000,000. They prefer silver for many reasons, and it is going to be very difficult to get them to surrender it. They themselves, as we understand it, do not contemplate forcing silver into circulation, but the experience of the ages has taught them to prefer a metallic money, and they are not going to surrender the privilege of insisting upon silver payment in the near future.

If the Far East would agree to accept a silver standard calculated upon a certain percentage of the bullion we might be able to re-establish prosperity with the trans-Pacific countries who have become our neighbors. We are really closer to China and Japan than any other countries of the world, and there is no reason why we should not increase our business with them.

Otherwise, markets do not show any features. The bond market is firm, and more active, and those who find in rising bonds a sign of returning business prosperity are correspondingly heartened.

Coffee has shown remarkable firmness, and sugar is surprisingly steady when the excessive supply is considered. Copper is steady at 10 cents, and some well-informed producers think it will soon be worth more. When it was made clear that the much-talked-of railroad consolidation could not be effected for at least a year, there was less enthusiasm for the proposed mergers, and it looks now as if it would be put upon the slowly moving carrier which travels between the White House and the two houses of Congress.

The President and Congress seem to be almost hopelessly at odds, and the farmers who need the aid which the Government is willing to give are having a hard time of it while the Senators and Representatives consider the difference between Tweedledum and Tweedledee.

The wonder of it all is that under such conditiones there should be any ground for optimism; but there is, and whether it be due to the natural hopefulness of the American people or to the calm that precedes the storm, no one can deny that the United States is giving a marvelous exposition of the financial strength that has enabled it to stand the blows that it got in Congress last year, and take this chastisement that has been administered since Congress came together after the new year. The expectation of an extra session is now general. Perhaps it would be better to have it and end the present impasse so that the suffering people who need aid can procure it.

Otherwise the business outlook seems to be encouraging, and if we could get some really constructive and non-political legislation out of Washington we might see almost a boom in business generally.

THE BUSINESS WEEK

January 21, 1931

THE first two weeks of the year have made a good showing. . . . Steel production has come back from the holiday low point at about the usual speed, with a fairly large back-log of forward business. Building contracts continue well sustained for the season. . . . Carloadings of merchandise are following their normal trend. . . . Currency in circulation is no longer being disturbed by abnormal factors; check payments at the beginning of the year were larger than usual; and the volume of commercial loans is holding above seasonal expectations. . . . Our index has risen fairly strongly from its bottom at around 77% of normal to nearly 80%. . . . All these things, together with steady commodity and stock markets, a stronger bond market, and some resumption of employment, indicate that deferred replacement demand by consumers, as well as better domestic investment or reinvestment demand, are making for some business improvement. . . . The darkest clouds in the sky are the spread of labor troubles abroad, the complete absence of foreign financing, the continued absorption of gold by this country and France, the deepening divisions in domestic politics, and the open endorsement by dominant financial authorities of the idea that what this country needs is not merely a good five-cent cigar, but also a five-cent standard of living.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

VOLUME of business in iron is insufficient to test prices quoted. While appreciable quantities of steel now are going into pipe, structurals, tin plates and rails, buying on the part of small users out of warehouse stocks is experiencing a severe slump. In the non-ferrous materials there were advances effective during the week in antimony, scrap brass and copper, wiping cloths and linseed oil. Compensatory declines occurred in copper, tin, zinc, febricated brass and copper and scrap lead.

(All prices as of Jan. 16, 1931)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
Ala. Foundry (Silicon, 1.75@2.25)	$14.19@$14.69
Tenn. Foundry (Silicon, 1.75@2.25)	14.19@ 14.69
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	20.41@ 20.91
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	14.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	18.26@ 19.26
Virginia No. 2 (Silicon, 1.75@2.25)	22.29
Basic	17.25@ 17.50
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.51
PITTSBURGH: (including freight charge, $1.76, from Valley)	
No. 2 Foundry	18.76
Basic	18.76
Bessemer	19.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.40†
No. 12	1.95	3.45†	3.10	3.45†
No. 14	2.05	3.55†	3.20	3.50†
No. 16	2.15	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2 30@2.40	3.75†	3.55	3.85
No. 24	2 35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.55
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.65
No. 16	2.40@2.50	3.85†	3.70	3.75
No. 18	2.55@2.65	4.00†	3.85	3.90
No. 20	2.70@2.80	4.15†	4.00	4.05
No. 22	2.75@2.85	4.20†	4.05	4.10
No. 24	2.90@3.00	4.35†	4.20	4.25
No. 26	3.15@3.25	4.60†	4.35	4.50
No. 28	3.40@3.50	4.85†	4.70	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
¾	.58½	2.875	2.469	.203
1	.76½	3.5	3.068	.216
1¼	.97	4.0	3.548	.226
1½	1.09	4.5	4.026	.237
2	1.48	5.563	5.047	.258
2½	1.92	6.625	6.065	.28
3	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—¼	⅜	½	⅝	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¼-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.00@11.50
Tin, Straits, pigs, New York			29.00@30.00
Lead, pigs, E. St. Louis	4.55	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.02½	New York	5.50@ 6.50

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.50	10.75
Copper sheets*	20.25	20.25	20.25
Copper wire*	12.75	12.87½	12.87½
Copper, drawn, round*	18.75	19.25	18.75
Copper tubing*	22.62½	22.62½	22.62½
Brass sheets, high*	17.37½	17.37½	17.37½
Brass tubing, high*	22.25	22.25	22.25
Brass rods, high*	15.62½	15.62½	15.62½
Brass wire, high*	17.62½	17.62½	17.62½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	21.50	21.50	18@20

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	45.00
Commercial genuine, intermediate grade	34.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.00	8.25	7.25@ 7.75
Copper, heavy, and wire	7.50	7.75	6.75@ 7.25
Copper, light, and bottoms	6.75	7.00	6.00@ 6.50
Heavy lead	3.50	4.00	3.00@ 3.50
Lead battery plates	1.50	2.00	2.00@ 2.50
Brass, heavy, yellow	4.50	4.75	4.00@ 4.50
Brass, heavy, red	7.25	8.00	6.25@ 6.75
Brass, light	3.50	4.00	3.50@ 4.00
No. 1 rod-brass turnings	4.75	5.00	4.25@ 4.75
Zinc	1.50	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.15	38.00 per M	.14½
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.096	.104	.098
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.1562½	.1612½	.2125
Solder (½ and ½)	per lb.	.215	.215	.2975
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%	65%	50–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville, 2.40@2.50		
Coke, prompt foundry, per net ton	Connellsville, 3.50@4.85		
White lead, dry	100 lb. kegs	New York, 13.25	
White lead, in oil	100 lb. kegs	New York, 13.25	
Red lead, dry	100 lb. kegs	New York, 13.25	
Red lead, in oil	100 lb. kegs	New York, 14.75	

*Less than 3 reams. †Less than 200

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Boston—Colonial Scale Co., 100 Purchase St.—bandsaw, 20 to 30 in. with or without motor.

Mass., Boston—Gerard Electric Co., 92 Pearl St.—lathes, drills, metal and woodworking machinery, paint spraying outfits, air compressors and electric motors.

Mich., Detroit—Detroit Gray Iron Foundry, Meldrum and Wight Sts.—five 10 ton traveling cranes, miscellaneous foundry equipment, etc. for proposed 2 story, 75 x 160 ft. foundry. Estimated cost $100,000.

Pa., Erie—Bd. of Education, R. S. Scobell, Secy., Library Bldg.—metal and woodworking equipment for proposed high school at 10th and Sassafrass Sts.

Pa., Oil City—National Transit Co., F. D. Williams, Pres., Seneca and Center Sts. — 5, 10, 20 and 25 ton cranes for proposed machine shop and warehouse group.

Vt., Braintree—Postmaster—small Lane sawmill, power rip saw, cut-off saw and electric motors.

Ont., North Bay—William Kennedy & Sons Ltd., Owen Sound—machinery and equipment for the manufacture of steel grinding balls for mining industry for proposed plant here.

Opportunities for Future Business

Calif., Richmond—Atchison, Topeka & Santa Fe Ry. Co., 6th and Main Sts., Los Angeles, is having plans prepared for the construction of a 1 story shop here. M. C. Blanchard, Los Angeles, is chief engineer.

Conn., Bridgeport — Bridgeport Metal Goods Co., Cherry St., awarded contract for a 1 story, 60 x 100 ft. factory. Estimated cost $40,000.

Conn., Bridgeport — Dugan Bros. Inc., 290 South 5th St., plans the construction of a garage, service and distribution station. Estimated cost $60,000. H. Holder, 242 Franklin Ave., Brooklyn, N. Y., Archt. Maturity indefinite. Noted Jan. 1.

Conn., Bridgeport—Goodrich-Silvertown Inc., 386 Fairfield Ave., is having plans prepared for the construction of a service plant. Estimated cost $60,000. Private plans.

Conn., Meriden — State Industrial School for Boys, R. L. McLaughlin, Supt., is having preliminary sketches made for the construction of a service building, work shop, garage, etc. Estimated cost $220,000. W. T. Arnold, High St., Hartford, Archt.

Conn., Naugatuck — Eastern Malleable Iron Co., 719 South Ave., Bridgeport, plans to rebuild plant on Bridge St. here. Estimated cost $40,000. Private plans.

D. C., Washington—O. J. Maigne Co., 356 Pearl St., New York, N. Y., will receive bids about July 1 for the construction of a 4-story plant for the manufacture of printers' rolls, here. Estimated cost to exceed $40,000. Dodge & Morrison, 160 Pearl St., New York, Archts. Noted Sept. 11.

Ga., Austell—Clark Thread Co., 2600 Ogden St., Newark, N. J., plans the construction of a thread spinning plant, including machine shop, power house, etc., here. Estimated cost $2,000,000. J. E. Sirrine & Co., Greenville, S. C., Archts. and Engrs.

Ill., Pekin—Corn Products Refining Co., 17 Battery Pl., New York, N. Y., is having plans prepared for the construction of a corn sugar refinery, including machine shop, power house, etc., here. $2,000,000. Also additions to refinery at Kansas City, Mo. Cost to exceed $200,000.

Ill., Springfield—Illinois Power Co., A. P. Mackie, Pres., 314 East Capitol Ave., plans the construction of a 1 and 2 story, 150 x 200 ft. garage on Washington St. Estimated cost $150,000. Private plans.

Ind., East Chicago—Inland Steel Co., is having plans prepared for the construction of a plate strip mill. Estimated cost $5,000,000. Private plans.

Ia., Carroll — County Auditor, will receive bids until Feb. 9, for the construction of a maintenance garage.

Md., Baltimore—Slaysman & Co., 801-11 East Pratt St., plans a 1 story, 23 x 57 ft. addition to factory for the manufacture of automatic can-making machinery, power presses, air compressors, etc.

N. J., Jersey City—J. Goldenberg, 80 Woodland St., Englewood, will receive bids about April 1 for the construction of a 4 story, 90 x 150 ft. garage, etc., at Sip and Summit Aves. Estimated cost $250,000. C. Shilowitz, 26 Journal Sq., Archt.

N. J., Jersey City—Jersey City Ladder Co. Inc., 677 Montgomery St., is having revised plans prepared for the construction of a 2 story, 45 x 140 ft. factory on Crawford St. Estimated cost $50,000. B. Singer, 921 Bergen Ave., Archt. Noted Aug. 28.

N. J., Maplewood — LeRoy Schenck, 513 Valey St., will receive new bids about Mar. 1 for the construction of a 2 story shop and garage. Estimated cost $40,000. R. B. Flatt, 600 Bloomfield Ave., Bloomfield, Archt. Noted Oct. 23.

N. J., Newark—Heller Tool Co., 865 Mount Prospect Ave., postponed construction of a 2 story addition to factory at Mount Prospect Ave. and Erie R.R. $40,000. Indefinite when project will mature.

N. J., Newark—M. & H. Machinery & Engineering Co., c/o A. Neuscheler, 40 Clinton St., postponed construction of 2 story factory at Euclid Ave. and Esther St. $40,000. Indefinite when project will mature. Noted Oct. 30.

N. J., North Bergen—Bd. of Council, Town Hall, is having revised plans prepared for the construction of a 2 story garage, signal station, etc. Estimated cost $150,000. R. B. Glenn, Town Hall, Archt. and Engr.

N. J., Paterson—Lee & Heurtt, 152 Market St., Archts., will receive bids about Feb. 1 for the construction of a 2 story factory for J. S. Royal. Estimated cost $40,000.

N. J., Secaucus — Curtiss Wright Airports Corp., 27 West 57th St., New York, N. Y., is having plans prepared for the construction of an airport including hangars, machine and repair shops, assembly plant, garages, etc., here. Estimated cost approximately $10,000,000. Architect not announced. Stone & Webster, Inc., 120 Broadway, New York, Supervising Engrs.

N. Y., Brooklyn—Dept. of Hospitals, Municipal Bldg., New York, is having preliminary plans prepared for the construction of an automobile service and repair shop at Kings County Hospital, 451 Clarkson St., here. Estimated cost $300,000. Le Roy P. Ward, 205 East 42nd St., New York, Archt.

N. Y., Brooklyn—One Thousand Eight Pitkin Ave., Corp., A. W. Norek, Pres., 66 Court St., will receive bids in late fall for the construction of a 4 story service garage, etc. at Pitkin Parkway and Eastern Parkway. Estimated cost to exceed $75,000. H. J. Nurick, 44 Court St., Archt. Noted Nov. 20.

N. Y., Brooklyn — St. Johns Corp., 1350 Broadway, New York, will receive bids in March for the construction of a 2 story, 162 x 225 ft. service garage at 281 Albany Ave. here. Estimated cost $150,000. S. Pelton, 110 West 42nd St., New York, Archt. Noted Dec. 12.

N. Y., Glendale—Phil Dietz Coal Co., Ridgewood, will receive bids about April 1 for the construction of a service garage at 62nd St. and 74th Ave. H. C. Bruckner, 2424 Myrtle Ave., Brooklyn, Archt.

N. Y., Elmhurst—Cord Meyer Co., Broadway, is having preliminary plans prepared for the construction of a 100 x 200 ft. service garage at Roosevelt Ave. between 88th and 89th Sts. Estimated cost to exceed $90,000. R. Tappan, 1134 Atom Pl., Forest Hills, Archt.

N. Y., Long Island City — General Bronze Corp., 10th Ave., will receive bids after Mar. 15 for addition to plant. Est. cost $500,000 to $1,000,000. Private plans. Noted Nov. 20.

N. Y., New York — Kenjohn Realty Corp., K. P. Steinrich, Pres., 362 West 23rd St., will receive bids late in July for the construction of a 6 story, 74 x 197 ft. service garage at 435 West 25th St. Estimated cost $400,000. L. E. Dell, Bogota, N. Y., Archt. Noted Jan. 8.

N. Y., New York — Hoffman Development Corp., 147 East 51st St., postponed taking of bids until fall for a 7 story service garage at 232 East 36th St. Estimated cost to exceed $40,000. C. Schaefer, Jr., 332 East 149th St., Archt. Noted Sept. 25.

N. Y., New York—D. Salitino, 1839 Sedgwick Ave., plans the construction of a 1 story, 75 x 165 ft. service garage at Sedgwick Ave. and 169th St. Estimated cost $40,000. W. Hohauser, 17 West 44th St., Archt. Maturity about September. Noted Jan. 1.

N. Y., New York—Sidlo Realty Co., c/o L. Silver, 391 East 149th St., will receive bids about Aug. 1, for the construction of a 2 story, 50 x 140 ft. service garage at Webster Ave. and Mosholu Parkway. Estimated cost $40,000. Siegel & Levy, 1775 Broadway, Archts. Noted Jan. 1.

N. Y., New York—Star Co., 200 South St., will receive bids about Feb. 1, for the construction of a warehouse and industrial building at Water St. and Market Pl. Estimated cost $175,000. Lockwood, Greene & Co., 100 East 42nd St., Archts. Noted Jan. 8.

N. Y., Richmond Hill—Warner Quinlan Co., 2 Park Ave., New York, will receive bids until Apr. 1, for the construction of a service garage, etc. at Vermont Ave. and 44th Rd. here. Estimated cost $50,000.

O., Canton—United Engineering & Foundry Co., 1400 Grace Ave. N. E. awarded contract for improving and enlarging plant including the installation of new equipment, new furnace, etc. Estimated cost $100,000.

O., Cleveland—Otis Steel Co., 3341 Jennings Rd., awarded contract for the construction, equipment and installation of a 1 story continuous strip steel mill. Estimated cost $1,800,000. Noted Sept. 25.

O., Cleveland—Reserve Lithographing & Printing Co., P. N. Calvert, Pres., Caxton Bldg., will soon award contract for a 3 story, 100 x 132 ft. lithograph plant at East 9th St. and Wigman Pl. Estimated cost $150,000. W. R. Powell, Rose Bldg., Archt.

O., Cleveland—Yoder Co., H. O. Yoder, Secy. and Treas., 5500 Walworth Ave., (machinery manufacturers), awarded contract for the construction of a 1 story, 97 x 400 ft. factory at West 55th St. and Walworth Ave. Estimated cost $200,000. Noted Dec. 11.

O., Columbus — City, W. H. Duffy, Dir. of Service, awarded contract for a 1 story, 67 x 187 ft. garage on North Front St. Estimated cost $29,888.

O., Dayton—Dayton Greenhouse Mfg Co., 939 South Perry St., is having plans prepared for a 1 and 2 story, 60 x 400 ft. factory at Miami Chapel Rd. Estimated cost $75,000. Geyer & Neuffer, Arcade, Archts. Noted Jan. 15.

Pa., Apollo—Bd. of Education, J. C. Hunter, Pres., will receive bids until Jan. 29 for the construction of a 2 story, 124 x 163 ft. high school, including woodworking shop, etc., on Pennsylvania Ave. Estimated cost $150,000. Vans Engineering Service, Blairsville, Archt. H. M. Rogers, Johnstown Trust Bldg., Johnstown, Engr.

Pa., Oil City—National Transit Co., F. D. Williams, Pres., Seneca and Center Sts., awarded contract for the construction of a machine and warehouse group including 160 x 285 ft. erecting and shipping building, 110 x 285 ft. finished pumps storage building, 86 x 190 ft. raw material warehouse, 65 x 84 ft. toolroom, tool making and jig storage building, 62 x 174 ft. casting, cleaning and welding building, 58 x 60 ft. production office and foundry extension, 32 x 182 ft. side floor extension for crane, remodel light machine shop. Estimated total cost $300,000. R. Stormer, c/o owner, Engr. Ford, Bacon & Davis, 39 Broadway, New York, N. Y., Consult. Engrs.

Pa., Philadelphia — La France Industries, Adams and Orthodox Sts., plans to rebuild upholstery textile manufacturing plant recently destroyed by fire. Estimated cost $40,000.

Pa., Pittsburgh — Bd. of County Commissioners, J. Armstrong, Chn., 519 Smithfield St., awarded contract for excavation and foundation for county airport including 73 x 114 ft. administration building, 30 x 197 ft. auxiliary building, 105 x 152 ft. hangar building, etc., on Mifflin Rd.

Pa., Sharpsville — Sharpsville Boiler Works, will soon award contract for an assembly building for gasoline pumps. Estimated cost to exceed $40,000.

Tex., Fort Worth—Corp., c/o H. Scullin, c/o Scullin Steel Co., 6700 Manchester St., St. Louis, Mo., is having preliminary plans prepared for the construction of a fabricated steel manufacturing plant here. Estimated cost $3,000,000. McCrossin & Knapp, 82 Beaver St., New York, N. Y., Engrs.

Tex., Presidio—Atchison, Topeka & Santa Fe Ry. Co., Amarillo, Tex., is having plans prepared for plant for creosoting railroad ties, including high pressure operated rooms for forcing creosote into the ties here. Estimated cost $100,000. W. W. Kelly, Amarillo, Ch. Engr. (Western Lines).

Va., Roanoke—Barrett Co., 40 Rector St., New York, N. Y., plans the construction of a plant for the manufacture of roofing and road building materials here. Estimated cost to exceed $100,000.

Ont., Fort William—Canadian National Railways, H. O., 360 McGall St., Montreal, Que., awarded contract for the construction of a 60 x 900 ft. freight building here. Estimated cost $150,000. C. B. Brown, Montreal, Que., Ch. Engr.

Ont., North Bay—W. Kennedy & Sons Ltd., Owen Sound, plans the construction of a plant for the manufacture of steel grinding balls for the mining industry here.

Ont., Ste. Catherines — Lincoln Foundry & Machine Works Ltd., F. W. Wilson, Pres., plans the construction of a plant for the manufacture of hydraulic and dipper dredges, etc.